レジリエントシティ・アクションプラン策定のための能力開発研修

～阪神淡路大震災に学ぶ～

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Training Workshop for Building Capacity in the Development and Implementation of Resilient City Action Plans in Asian Cities

Learning from Great Hanshin-Awaji Earthquake in Japan

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【執筆・編集】

（公財）地球環境戦略研究機関

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1. 企画･準備

1-1. 背景

現在、多くのアジアの都市では経済発展に伴い急激な都市化が進行する一方、気候変動等に伴う災害リスクに対する対策方針の策定やインフラ整備等のスピードがそれに追い付かず、住民の安全や資産の保護に関する脆弱性が高まっているという課題を抱えている。特に違法建築等が多い人口密集地域では、そのリスクは更に深刻である。2013 年のアジア開発銀行の資料によると、2011 年に地球上で発生した災害の 8 割はアジア太平洋地域で起きており [1]、アジア各国にとり、その対応策の強化と災害に強いレジリエント都市構築は急務となっている。

2011 年の東日本大震災により大きな損害を被った仙台市にて開催された第 3 回国連防災世界会議（2015 年 3 月 14～18 日）では、新しい防災対策の行動指針となる「仙台防災枠組 2015-2030」がポスト「兵庫行動枠組 2005-2015」として採択された。これは、災害による被害者数を大幅に削減し速やかな復興を目指すだけでなく、気候変動の影響や災害多発地域で都市計画がうまくいっていないために新たに予想されるリスクの軽減も目標としている。また、この枠組の中では、自治体が住民と協働し、積極的に防災に関する政策の策定･実施を進める必要性が強調されている [2]。

このような背景のもと、IGES は、名古屋大学、法政大学、大阪大学との共同研究、環境省環境研究総合推進費課題番号 1-1304「『レジリエントシティ政策モデル』の開発とその実装化に関する研究」のサブテーマ4「アジアの都市におけるレジリエンス評価と政策モデルの試行」において、アジア 4 都市（フィリピン･セブ市、タイ･ノンタブリ市、ベトナム･ホーチミン市、中国･上海市）を調査対象地とし、2 年間に亘り、過去の災害時における自治体の対応や各都市のレジリエンシー（強靭性）を評価し、レジリエントシティ構築戦略の策定支援を行ってきた。

本研究を通して、都市のレジリエンシー強化のためには都市ガバナンスを確立･向上させ、防災分野に適切な人員および予算を配分し、防災担当職員の継続的な能力開発を推進することの必要性が確認された。更に、本研究により、現時点での顕在リスクに対処するため、限られた予算でも実行可能なアクション･プランを作成することが重要であり、その参考となる指標やツールの需要が大きいことが分かった。また、過去の災害から復興を遂げた

1 ADB and ADB-Institute (2013): Disaster Risk Management in Asia and the Pacific: Issue Paper, Asian development Bank institute, Japan

2 『仙台防災枠組 2015-2030』については UNISDR の下記 URL に詳細が掲載されている。http://www.wcdrr.org/uploads/Sendai_Framework_for_Disaster_Risk_Reduction_2015-2030.pdf.（2015 年 9 月 4 日閲覧）

都市の経験から学び、その事例を共有して各都市の実状に活かすために、それを知識体系として整理することと、出し手側だけでなく受け手側の職員の能力強化も有効であることが共通認識として得られた。

1-2. 目的

「自然災害大国」とも呼ばれる日本では、各自治体が長年に亘り災害に強いまちづくりに取り組んでいる。全国的に甚大な被害をもたらした 1959 年の伊勢湾台風を受け、1961 年、日本政府は災害対策基本法を制定 [3]し、国家レベルの包括的災害対策システムを設立した。以降、本法案やその他付随する政策等は、大規模災害が発生する度に見直され、更新されてきた。そして、死者 6,343 人の被害となった 1995 年の阪神淡路大震災、死者･行方不明者数が 2 万人を越えた 2011 年の東日本大震災を経て、災害への備えと継続的な防災訓練の重要性が改めて認識され、国土強靭化に向け、レジリエント都市の構築は継続的に強化されている。

これまでの研究において前述のような結果が得られていることを踏まえ、本年度は、アジア 4 都市より防災対策政策構築に重要な役割を担う行政機関職員等を日本へ招聘し、阪神･淡路大震災から 20 年を経た神戸市から、復興政策や防災計画の方針、レジリエント都市構築のための政策策定、住民の防災に対する意識向上に対する取り組み等について学ぶための能力開発研修を実施した。

1-3. 準備

本研修は自治体職員がターゲットとなるため、主要プログラムとしては、主に神戸市役所環境局環境貢献都市課の協力を仰ぎ、地方行政機関の災害対応と復興政策に学ぶことを中心においた。災害時の様々な障害･問題にどのように対処したのか、震災の教訓が現在の防災対策にどう活かされているかなど、包括的な災害対策に関しては危機管理室に、また、地震に限らずさまざまな自然災害で問題となる災害廃棄物処理に関しては環境政策部に講義を依頼した。神戸市建設局下水道部には、大規模災害から得られた教訓を活かしたプロジェクトを展開している東灘水処理場とこうべバイオガス･ステーションの概要紹介と施設視察を依頼した。

コミュニティレベルで防災意識を高めるためのヒントとしては、全国で初めて防災に特化したコースを設立した兵庫県立舞子高校に視察を依頼した。同コースは、命の大切さ、助け合いの素晴らしさなど、震災の教訓に学ぶ「新たな防災教育」を推進してきた兵庫県により

3 内閣府,“防災情報のページ.“ http://www.bousai.go.jp. (2015 年 9 月 4 日閲覧)

2002 年に設立され[4]、座学に加え、周辺の防災施設や福祉施設等と協働した実践的な防災教育プログラムを特長としている。

また、大震災の記憶を風化させないために設立された「人と防災未来センター」を訪問し、阪神淡路大震災の実際や、市民の声、救援活動状況を総合的に学ぶと共に、災害記録の発信について視察することとした。同センター研究部では国の防災政策研究も行っていることから、同センターには日本政府の災害対策方針に関する情報提供を依頼した。

このほか、神戸市には防災・減災研究を展開する大学等の研究機関や防災訓練が体験できる施設など多数存在しているが、招聘者の所属機関の特質や滞在可能期間、協力組織から提供される知見や情報の内容等を検討し、研修内容を決定した。各協力機関には企画内容を理解してもらい、全面的な協力を仰いだ。また、神奈川県横浜市にて 2015 年 7 月 28 日･29 日の 2 日間開催された「持続可能なアジア太平洋に関する国際フォーラム（ISAP2015）」において、本研修を含むこれまでの本研究課題の成果発表を行った。

招聘に際しては、過去 2 年の研究活動に積極的に参画したアジア4都市のカウンターパートに参加を依頼した。各人とも各都市の防災対策策定に実質的な影響力を持つポジションにあることから、今後、本研修の成果が各都市の政策に直接的に適用されることが期待される。

4 兵庫県立舞子高等学校, "環境防災科について." http://www.hyogo-c.ed.jp/~maiko-hs/bosai/kanbou1.htm.（2015 年 9 月 4 日閲覧）

2. 実施内容

2-1. 研修の概要

- 実施日時　　2015 年 7 月 27 日(月)～29 日(水)
- 開催場所　　兵庫県神戸市･神奈川県横浜市
- 参加者

ベトナム･ホーチミン　Dr. Nguyen Trung Viet（ホーチミン市気候変動懇談会会長）
中国･上海　　Dr. Qunfang Hu（上海防災救災研究所副所長、同済大学教授）
タイ･ノンタブリ　　Ms. Pornsri Kictham（ノンタブリ市長顧問）
フィリピン･セブ　　Hon. Ma. Nida C. Cabrera（セブ市議会議員、環境委員会議長）
　　Hon. Ms. Lea O. Japson（セブ市議会議員、社会福祉委員会議長）

- 協力機関等

神戸市環境局(環境貢献都市課、環境政策部、危機管理室)、建設局下水道部
(公財)ひょうご震災記念 21 世紀研究機構･人と防災未来センター
兵庫県立舞子高等学校環境防災科
神戸学院大学現代社会学部社会防災学科准教授　舩木　伸江氏

- 研修日程

8/26(日)	参加者来日
8/27(月)	＜午前＞ 神戸市役所環境局による防災政策研修 ・ 講義1『神戸市危機管理システムおよび災害時初動体制について』 （危機管理室） ・ 講義2『災害廃棄物の処理について』(環境局環境政策部) ＜午後＞ ・ 講義3『神戸市の下水処理システムについて』(建設局下水道部) ・ 東灘処理場･こうべバイオガス･ステーション視察
8/28(火)	＜午前＞ 兵庫県立舞子高校視察および交流ディスカッション ・ 太陽光パネル視察 ・ 舞子高等学校環境防災科の概要 ・ 学生との交流ディスカッション ・ アジア4都市の防災政策について紹介 ＜午後＞ 人と防災未来センター視察 ・ 講義『日本政府の防災政策･技術』 ・ 展示物等見学 夕刻：横浜市へ移動
8/29(水)	持続可能なアジア太平洋に関する国際フォーラム(ISAP2015)」参加 セッション7『アジアの自治体によるレジリエント都市構築に向けた取り組み』
8/30(木)	参加者帰国

東灘処理場視察

2-2. 1日目：神戸市の災害・防災対策

1 日目午前は神戸市役所を訪問し、大震災からの復興の過程と課題、震災ごみの処理方法や現在の防災対策について、さらに、震災から得られた教訓が2011 年の東日本大震災復興でどう生かされたかについて講義を受けた。まず、危機管理室の三木一弘氏より、地震発生時の初動対応の状況、人命救助活動、被害を受けた市民への緊急医療対応などを時系列でたどり、続いて、震災前の職員マニュアルと実際とのギャップや仮設住宅問題になどの問題にどう対応したか、そこから得られた教訓が現在にどう活かされているかについて説明があった。次に、環境政策部の金子信一氏より、想定を遥かに凌駕する大量のごみの搬送・処理に関連して発生した難問と、その経験がその後の復興事業に繁栄された経緯等について講義があった。これら多くの課題の中には、解決に数年を要したものもあった。神戸市は、激甚災害に対して行政機関ができることは限られているとしながらも、この 20 年間、住民と共に、平常時の備えを強化することを目指してきた。震災時には、市民による独自の人命救助活動で数多くの命が救われたことから、1995 年には「防災福祉コミュニティ（防コミ）」事業をスタートさせ、日常生活の中で主に高齢者を対象としたコミュニケーションをはかり、緊急時にはコミュニティが主体となり対応できる体制を整えている。神戸市ではこのシステムを「BOKOMI」と称し、海外に向けても同様の取り組みを推進している。また、震災当時には国内外からボランティアが支援に訪れたが、当時は市側の受け入れ態勢が定まっておらず、混乱した面もあったため、現在は南海トラフ地震を想定した受援計画を策定している。その他、一般住宅に対しては、倒壊した建物により数多くの死傷者が出たことから、震災後の復興住宅はもちろん、一定の年数が経過した住宅には、行政が補助金を支給し、耐震構造を導入したリフォームの支援を行った。さらに、行政機関の体制強化として、2012

年には、免震構造を採用した施設に非常用電源、水供給施設、オペレーションセンター等を設置した「危機管理センター」を完成させた。

こうした取り組みの土台である震災から得られた教訓は、2011 年の東日本大震災で活かされることとなった。例えば、阪神淡路大震災では、市民が元のコミュニティからばらばらに移動して仮設住宅に入居したため、当初は住民間での意思疎通がうまく行かず、さまざまな日常生活のトラブルだけでなく、高齢者の孤独死と言った深刻な問題も起きた。そこで、東日本大震災では、仮設住宅への入居をなるべくコミュニティ単位で行い、震災後の市民の不安定な精神状態をできるだけ緩和させる工夫がなされた。また、災害廃棄物に関しても、阪神淡路大震災ではがれき等の再利用率は 46%であったが、がれきの収集時からの分別徹底、ボランティアへの分別周知の徹底といった教訓を活かし、東日本大震災では、災害廃棄物を公園事業、港湾埋立、海岸防災林復旧、海岸堤防復旧などの公共事業に、8割以上再生利用することができている。

午後は、震災で壊滅的な被害を受けた東灘処理場を訪問し、同処理場の高橋俊二氏と楠田隆史氏の案内により、環境にやさしく、地域に密着した下水処理場に生まれ変わった経緯とその技術を研修した。同処理場は神戸市内最大の施設で、震災時、発生から 100 日間稼働することができない程の被害を被った。この経験から、復興の一環として、市内の処理場を地下パイプでつなぐ一大事業が実施され、現在は、いずれかの処理場が機能停止となっても、地下パイプで汚水を他の処理場へ送ることができるようになった。さらに、処理水は町の中に設けられた噴水やせせらぎを潤す水として供給されており、非常時には消火用水としても利用できる。また、2004 年からは、民間企業の協力を得、汚水処理時に発生するガスを市営バスなどの燃料として利用する「こうべバイオガス」事業を開始した。2011 年からは「KOBE グリーン・スイーツ・プロジェクト」が始動し、神戸市内で盛んな製菓製造の際に発生する食品系廃棄物を下水汚泥と混合し、汚泥処理の効率化が推進された。2012 年からは、汚水から除去されるリンを再生利用する「KOBE ハーベストプロジェクト」が進められている。リンは下水処理においては赤潮やパイプ詰まりの原因となるため除去されているが、一方で肥料としての需要があり、世界的には枯渇が懸念され、日本でも全量を輸入に頼っている。神戸市ではこれを肥料の材料へと再利用する取り組みを開始し、今年4月、これにより栽培されたトウモロコシがはじめて収穫された。

また、同処理場のもうひとつの特徴として、周辺住民と協働した取り組みがある。震災からの復旧にあたり、市民と共に歩む下水処理場を目指すこととなり、敷地内に水路に沿った遊歩道が整備された。更に、住民の発案で、遊歩道沿いにはアーモンドの木が植えられた。春先に桜に似たピンクの花を咲かせるアーモンド並木は住民の憩いの場となっており、日常の散歩コースとして活用されているほか、音楽会などのイベントも開かれている。

以上の様に、神戸市では、震災の教訓を様々な面から政策に取り入れ、震災から 20 年経った現在も、災害に強いまちづくりが継続して行われている。

上：神戸市役所での講義風景

左：神戸市役所環境局職員の皆様と

上：バイオガス生成過程を視察

右：こうべバイオガスステーション

舞子高校環境防災科とのディスカッション

2-3. 2日目：コミュニティレベルの防災教育と震災の記録発信

2 日目午前は、2002 年に全国で初めて防災専門の教育コース「環境防災科」を設けた兵庫県立舞子高等学校を訪れ、同科のユニークな教育プログラムについて学ぶと共に、教師・学生と活発な意見交換を行った。はじめに、震災時に避難所となったことを契機に設置された、校舎屋上の太陽光発電パネルを見学した。続いて、同科教諭の的野記子氏より、環境防災科の設立経緯とカリキュラム内容について紹介があった。前述の太陽光発電システムが導入されていたことや防災教育の実績があったことなどから、同校は全国初の防災専門コースの設立校となった。現在、3 学年 118 名が在籍しており、週約 30 時間のうち約 10 時間（学年により時間数は異なる）が防災学習に充てられ [5]、外部講師による講義、防災訓練などの体験型授業や合宿・研修などの校外学習、国際交流活動が組み合わされた多彩な構成となっている。また、災害時には主体性を持って行動することが求められることから、学生による小学生を対象とした地域への防災啓発活動や、発表やディスカッションを中心とし、学生が自ら発信する姿勢を育むカリキュラムとなっている。

交流会には、2 年生、3 年生の 6 名の学生が参加した（夏休み期間中であったため、大半の学生が校外学習や部活動のため参加できなかった）。アジア4都市の参加者からは、災害とは、防災とは何か？ 災害が起きたらまず何をするか？ どうやって情報を集めるか？ 家庭で防災について話をすることがあるか？ といった質問があった。学生からは、災害時にはまず自分の身を守ること、正しい情報を集めること、平常時には過去の災害から学ぶことが大事、家族とも地震の話をする、といった回答があった。また、参加者は各都市

[5] 舞子高等学校“兵庫県立舞子高等学校　平成27年度入学生（42回生）教育課程表”, http://www.hyogo-c.ed.jp/~maiko-hs/youran/42.pdf. (2015 年 9 月 4 日閲覧)

の防災状況について紹介し、学生からは、上海のような高層ビルで災害が起きたらどう対処するのか、各都市ではどのような防災訓練を行っているのか、などの質問があった。

的野氏によると、普段の国際交流活動での質疑応答は日常生活に関連したものが多いということであったが、今回の研修では、災害や防災に特化した質問がほとんどであったため、学生たちには多少の戸惑いも見られたが、簡潔な言葉で的確に回答していた。また、アジア4都市の災害対策の発表にも熱心に耳を傾けていた。震災から 20 年が経った今、在学している全員が震災後に生まれた学生であるが、同コースの授業のみならず、東日本大震災の被災地でも定期的にボランティア活動を行っていることもあり、防災を日常のこととして認識し、高い関心を持ち続けている姿勢がうかがえた。

午後は、震災の記録を集めた「人と防災未来センター（DRI: Disaster Reduction and Human Renovation Institution）」を訪問し、震災の実際の様子を体感した。同センターは「震災の記憶を次世代に伝える」ことをコンセプトとして、震災の「生の記録」を数多く残しており、当時の状況や市民の思いが直に伝わる展示となっている。さらに、海外からの見学者には、英語・中国語・韓国語・スペイン語による通訳ガイドが同行することも可能であり、日本国内だけでなく、国際的な防災教育センターとしての機能も有している。

まず、同センター研究部長の村田昌彦氏より日本政府の最新の防災政策（国の防災体制、地震防災情報システム、予防対策等）について映像を含めたレクチャーを受けた後、見学ルートに沿い、ボランティア通訳ガイドの籾谷安儀氏の案内で復興までの街の様子や住民らの救助・避難の実態について学んだ。地震発生時の再現映像、折れた電柱や崩れ落ちた建物など当時の町の様子がそのままに再現された通路を通った後、展示室では、被害状況、復興までの道筋、当時の様々な問題（救助活動、保険、住居など）について具体的な解説が行われた。被災状況の写真、避難所で使われた日用品、海外から寄贈されたバイク、行方不明者を探す家族のチラシやビラ等が展示されており、その他、復興までの町が表現されたジオラマや、市民のインタビュー映像も多数展示されている。その後、さまざまな防災グッズを見学し、学習コーナーで耐震構造技術の紹介が行われた。

全ての展示物を見ることはできなかったが、壁一面に展示された震災の記録からは当時の混乱がそのままに伝わり、災害記録の保存の意義が十分に認識できた。

舞子高校屋上の太陽光パネル

人と防災未来センター視察

3. 研修総括

3-1. 神戸研修のレビューとディスカッション

全てのプログラムの総括として、2 日目午後には、神戸市のレジリエント都市構築に対する様々な取り組みから、それぞれの都市に適用できる事例や考え方について本研修のレビューとディスカッションを行った。まず本研修を通して得られた知見を個別に抽出した後、全体で結果を共有した。下記の表内で、各都市が重要とする知見の項目を丸印で示している。全都市が、行政機関の役割と若い世代への防災教育が非常に重要であるという認識に至った。

知見	セブ	ノンタブリ	ホーチミン	上海
1. 各都市とも災害と気候変動に対する十分な備えが必要である。レジリエント都市構築を担う行政の役割は非常に重要。	○	○	○	○
2. 市民、特に若い世代に対する防災意識の啓発、災害速報システム、防災訓練、ハザードマップや避難所周知の重要性	○	○	○	○
3. 新技術の導入（災害速報システム、リスク･アセスメントとその周知方法（ポッドキャスト）、エネルギー･水･下水処理･交通･廃棄物処理などの公共サービス）	○		○	○
4. 土地利用に関する政策策定、建築に関する法令策定とその厳正な運用	○		○	○
5. DRI のような震災関連機関を設立し、災害の記録を収集･公開する	○	○		

次に、各都市がそれぞれの都市に適用できるとした取り組みは下記の通りである。

適用できる取り組み	セブ	ノンタブリ	ホーチミン	上海
1. 市民への啓発（ハザードマップ、学校教育現場での防災訓練、防災グッズやDRIのような防災関連施設設立への市民参画）	○	○	○	○
2. 災害速報、リスク･アセスメント、水･交通･エネルギー等公共サービスへの新技術の導入			○	○
3. 土地利用に関する政策策定、避難所の指定、建築に関する法令、自然を活かした町づくり	○	○		
4. 防災および気候変動担当職員のキャパシティ･ビルディング（リスク･アセスメント、気候変動モデリング等）	○	○	○	

その他の発言を下記に挙げる。

- ♦ 人命を守る「自助」と「共助」という考え方を広く周知したい。
- ♦ 復興までの期間が非常に短いと感じられた。重機など設備が充実していたからか。
- ♦ 防災教育は限られた場（学校内）だけでなく、広く一般市民にも公開すべきである。
- ♦ 自分の都市では、災害が起きたときにどうしたらよいか、さっと答えられる学生は少ないと思う。参加型の防災教育を取り入れていきたい。
- ♦ 神戸市が多言語で配布している防災グッズのチェックリストは非常に有効であり、自分たちの都市でもすぐに活用できる。
- ♦ 利権が絡む土地利用規制は難しい。土地価格の下落を恐れ、ハザードマップ作成へ協力的でない市民や、賄賂が横行し違法建築の取り締まりは困難である。厳しい規制が必要。
- ♦ 日本の災害予報・速報の技術には大いに学ぶところがある。

以上の総括については、翌日 29 日に横浜市で開催された持続可能なアジア太平洋に関する国際フォーラム（ISAP2015）にて発表された。

本研修の成果は、参加者が各都市に持ち帰り、今後、それぞれの地域で災害対策に反映されることが期待される。研修終了直後、上海市、ノンタブリ市からは早速、下記のような具体的なレスポンスが寄せられた。

上海市の Qunfang Hu 氏は、「期待以上に学ぶことが多く、防災・減災についての考え方が大きく変わり、たいへん実りある研修だった」とコメントした。特に、上海防災救済研究所では、8 月末に神戸市で同様の視察を予定しており、本研修で得られた成果を活かした行程を再度提案し、視察に望みたいということであった。

タイ・ノンタブリ市の Pornsri Kictham 氏は、帰国後、ノンタブリ市長および防災担当職員ら 30 名に向け、本研修の成果発表を行ったと報告があった。今後、同市の洪水対策政策の策定に役立てたいとのことである。

タイ・ノンタブリ市での本研修成果発表会（左写真：ノンタブリ市長（右端）、Pornsri Kictham 氏（右から 2 番目））

3-2. ISAP2015

本研修に関しては、2015 年 7 月 28 日～29 日で開催された持続可能なアジア太平洋に関する国際フォーラム（ISAP2015）におけるパラレル・セッション『アジアの自治体によるレジリエント都市構築に向けた取り組み』でも報告された。本セッションの内容については、下記のセッション・サマリーを参照されたい。

ISAP2015　セッション・サマリー
パラレル・セッション 7『アジアの自治体によるレジリエント都市構築に向けた取り組み』

概要

近年、異常気象や気候変動による災害が各地で頻発・激甚化し、都市部における住民や資産の保護に関する脆弱性を抱えるアジアの都市では、これらの予測を超えた規模の衝撃やストレスに耐え、速やかに回復するためのレジリエント（強靭な）都市構築への関心が高まっている。本セッションではこれらの外的ストレスに対しアジアの 4 都市（フィリピン・セブ市、タイ・ノンタブリ市、ベトナム・ホーチミン市、中国・上海市）が具体的にどのような対策を立てているかを概観し、これらの都市が何を目的にどのような分野に注力し、どのような費用対効果の高い実践的な取り組みを実施し、どのような技術がこれらの災害リスク軽減向上に有効であり、かつ、それを外部及び内部からどのように効果的に支援可能か議論し、災害リスク軽減とレジリエント都市の概念をどのように都市計画・政策に織り込むことができるかを検討した。

スピーカーリスト

【スピーカー】

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ニダ・C・カブレラ （フィリピン・セブ市市議会議員）
ポーンスリ・キチャム （タイ・ノンタブリ市市長顧問）
グエン・チュン・ヴィエト （ホーチミン市天然資源環境局気候変動事務局長）
チュインファン・フー （同済大学教授／上海防災救災研究所副所長）

【討論者】

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【モデレーター】

前田 利蔵 （IGES バンコク地域センター長）

サマリー

プレマクマラ氏はアジアにおけるレジリエント都市構築を取り巻く課題の大枠を提示した。レジリエント都市を創設するためには、減災力、適応力、転換力の 3 つのキャパシティが必要となる。現在、アジア各 4 都市のうち、セブ市とノンタブリ市は災害防災を目指した減災力の強化に、ホーチミン市と上海市は気候変動に対する適応力の向上に努めている。今後は、どの都市においても、転換力を増強し更に強靭なまちづくりを実現することが求められる。

カブレラ氏は、セブ市がその対応力と復興力においては顕著な成果を収めてきてはいるものの、バランガイ（フィリピンにおける最小行政地区）毎のニーズとあらゆるリスク評価の結果をとりまとめ、災害リスク軽減・管理（DRRM）計画に反映させなければならないと述べた。

キチャム氏は、ノンタブリ市がいかに 2011 年の大洪水を克服したかについて発表した。キーファクターとなったのは前向きな思考と TEAMS（技術と時間（Techniques and time）、評価（Evaluation）、運営（Administration）、マンパワー（Manpower）、意欲と献身（Spirit and sacrifice））であった。

ヴィエト氏は、信頼に足るデータの欠如や人材不足、具体的なプロジェクト実施に必要な技術・財政サポートの不足のため様々な取り組みが窮境に追い込まれていると述べ、ホーチミン市レジリエント都市策定に生じている不具合を強調した。

フー氏は、上海市はリスク評価と策定に必要な技術力の向上や、インフラの設計構築、更には市民の意識向上と草の根協力に対する支援を行うため、十分な予算措置を取る必要があると述べた。

主要メッセージ

- ♦ レジリエント都市実現のキーファクターとは、防災と気候変動の両方に取り組む都市が効果的な総合計画を策定し、住民参加を促進することである。
- ♦ 都市の技術力を向上するためには、関連データの収集が不可欠である。データが既に取得済みである場合は、その全てのデータを一箇所に集め、策定に反映することが重要である。
- ♦ 短期的リスクが中心となる傾向の災害リスクマネジメントと長期的なレジリエンシーを結合させることが重要である
- ♦ 各スピーカーが参加した神戸市でのレジリエント都市策定に関する研修では、災害に対する日頃の備えと復興への取り組みに対する住民参加の重要性が明確になった。日本は、兵庫行動枠組及び仙台防災枠組や、また、アジア太平洋地域適応ネットワークにおけるキャパシティ・ビルディングや知見の協力への支援などを通し、大きく貢献している。

報告者：IGES サイモン・ギルビー/堀苑志乃


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添付資料

神戸市環境局講義資料

- Crisis Management System and Initial Emergency Response in Kobe City
- Disaster Waste Management

神戸市建設局下水道部講義資料

- Sewerage System in Kobe

ISAP2015 発表資料

- ISAP2015: Resilient Cities –Discussion Point- (Toshizo Maeda)
- Enhancing Capacities for Building Climate and Disaster Resilient Cities: Lessons Learned from Asian Cities (D. G. J. Premakumara)
- Planning a Disaster-Resilient City in Cebu, Philippines (Nida C. Cabrera)
- Planning Flood Resilient City in Nonthaburi, Thailand (Pornsri Kictham)
- Planning Climate and Disaster Resilient in Ho Chi Minh City (Nguyen Trung Viet)
- Study on How to Build a Disaster Resilient City in Shanghai, China (Qunfang Hu)
- Building Resilient Cities in Asia: A Training Workshop in Kobe

Crisis Management System and Initial Emergency Response in Kobe City

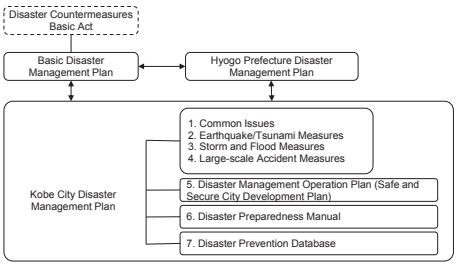
神戸市危機管理室

Crisis Management System and Initial Emergency Response in Kobe City

Crisis Management Office

I. Introduction

(1) Structure of Kobe City Disaster Management Plan



Structure of Kobe City Disaster Management Plan

(2) Issues occurring in the Great Hanshin-Awaji Earthquake

(1) Disaster-resilient community development
(2) Disaster-reduction drills and public awareness enhancement
(3) Disaster reduction activities
(4) Information collection, dissemination and publicity
(5) Wide-area collaboration and requests for support
(6) Rescue, first aid and medical systems
(7) Earthquake fire countermeasures
(8) Voluntary disaster reduction activities of citizens and companies
(9) Evacuation activities
(10) Rescue and relief measures
(11) Measures for ensuring safety in disaster-hit areas
(12) Lifeline measures
(13) Traffic and transportation measures
(14) Measures for livelihood stabilization
(15) Volunteer activities
(16) Secondary disaster prevention

Source: Kobe City Disaster Management Council
Kobe City Disaster Management Plan (draft)
June 1999

II. Outline of the Great Hanshin-Awaji Earthquake

Date of the occurrence: 5:46 a.m., January 17, 1995

Epicenter: Awaji Island (Latitude: 34.36°N, Longitude: 135.02°E)

Focal depth: Approx. 16 km

Scale: M 7.3

JMA seismic scale: 6 (7 in some areas)

Characteristics: Simultaneous vertical and horizontal shaking

(I) Initial response

(1) The Disaster Management Headquarters was set up with the mayor as the head after one hour following the occurrence of the earthquake in accordance with the Disaster Countermeasures Basic Act.
(2) Instructions from the mayor (on the morning of the day of the earthquake)
- Collect information by any means (grasp damage information, etc.).
- Saving life is the first priority.
- Work at the office nearest you. (Go to a ward office.)
- Open evacuation shelters (first in schools).
- Collect supplies and secure food.
- Start bus service as soon as possible.
- Re-open traffic on roads. Do not collect tolls on highways.
- Set up ward headquarters at the respective ward offices (for information collection and rescue of residents).
- Act spontaneously without consultation. (On-the-spot decision making)

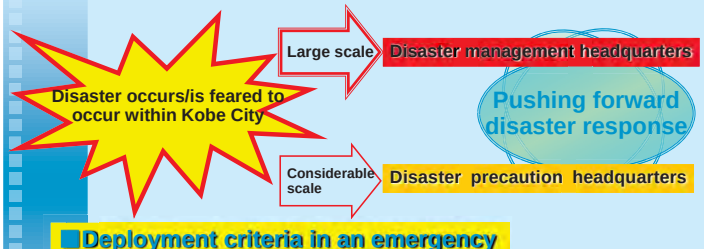
Mayor's press conference at the headquarters

(Photo provided by Kobe Shimbun)

Issues and lessons from initial response

- Clear definition of the criteria for establishment of the disaster management headquarters and prompt setup
- Securing a system for emergency assembly of the mayor and the deputy mayor after office hours
- Securing a system to assemble city personnel

Disaster Management headquarters deployment criteria (Kobe City Disaster Management Plan)



■Deployment criteria in an emergency

		Hyogo Seto Inland Sea Coastal Tsunami level of alert		
		Tsunami alert	Tsunami advisory	No tsunami predicted
Seismic Intensity in Kobe	5 (lower) or over	Disaster management headquarters		
	4		Disaster precaution headquarters	
	3 or under			Collecting information

Initiatives based on lessons: City personnel deployment system

・Dissemination of information and thorough understanding of the events based on which Kobe City Disaster Reduction Directive No. 3 is automatically issued

◎The criteria for issuing Kobe City Disaster Reduction Directive No. 3
- ・When an earthquake of a seismic intensity of 5 lower occurs in the city (5 at the time of the earthquake)
- ・When tsunami alert is issued on the coast of the Seto Inland Sea

Initiatives based on lessons: Securing of an initial response system (lodging for standby personnel and support of ward offices)

・Central lodging for standby personnel (since April 2000)

The housing for city personnel jointly constructed with the Central Fire Station in order to secure personnel for initial response

・Occupants (standby after working hours)

(1) Designated officials

Every day: A total of 2 personnel (whose positions are equivalent to managers of the Crisis Management Office or other bureaus) stand by.

Holidays: Director or Head of Crisis Management Office stands by.

(2) General personnel (for standby)

5 teams (around 10 people per team) stand by for one week in rotation.

・Standby of section chiefs of Crisis Management Office as a liaison on holidays

Initiatives based on lessons: The organization of Crisis Management Office

・Establishment of Crisis Management Office (April 2002)

・Allocation of employees concurrently assigned

67 personnel (including concurrent personnel) are stationed in the Crisis Management Office.

Periodic liaison meetings are held monthly. (Ad-hoc meetings are held in emergencies.)

・Sharing of weather and accident information through crisis management information system e-mail

Automatic notification from J-ALERT and other systems

Manual distribution from Crisis Management Office or Fire Bureau

・Collaboration with Fire Bureau

Strengthening of collaboration in the Crisis Management Center

Development of a hotline with the control center

Issues (2) Damage to Kobe City Hall main building

Initiatives based on lessons: Base of Kobe's safety and security Kobe City Crisis Management Center

・City Hall Bldg. 4 Created for this purpose

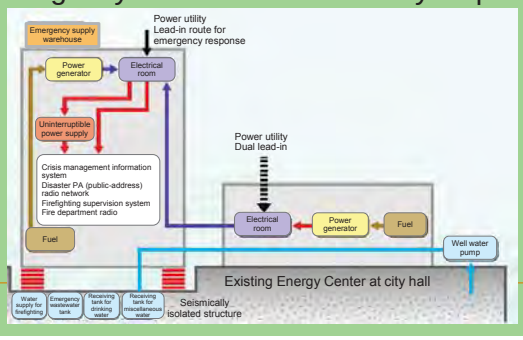
・Offered for use Apr 2012

・Steel-framed reinforced concrete construction

・Base isolated system with 9 floors and 1 floor underground

Initiatives based on lessons:

- Use of base isolated system
- Emergency power generators and electricity generator room located on upper floor
- Emergency stores to ensure 3 days' operation



2nd Floor Operation Center

4th Floor Firefighting Control Center

(3) Issues and lessons on information collection, dissemination and publicity

- In addition to failure of monitoring cameras in the Firefighting Control Center, TV broadcasting could not be received, which made it difficult to grasp the damage situation throughout the entire area of the city.
- Due to congested telephone lines, prompt information collection, dissemination and publicity were difficult.
- It is necessary to transmit information that meets changing citizens' needs over time.

Publicity at the time of the earthquake

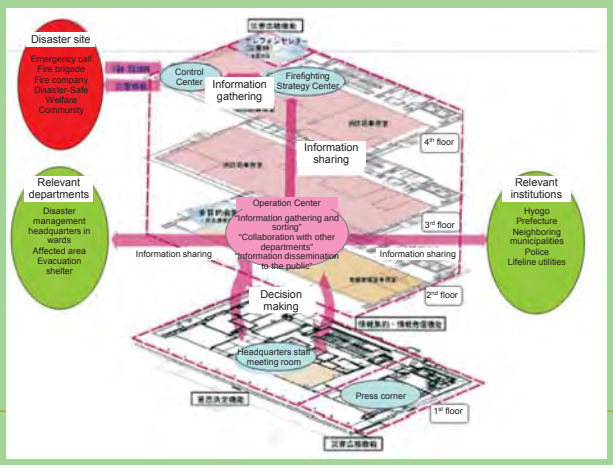
Handling consultation with citizens, etc.

- The Telephone Center was established to handle inquiries and consultation from citizens.
- The evacuees from the city were registered and information was provided to them.

Initiatives based on lessons: Information collection (Crisis management information system)

- **Construction of the crisis management information system**
  Direct transmission of the images taken from firefighting helicopters instantly
  Monitoring camera enables early information collection.
  Split-screen display of the images from firefighting helicopter and TV images

Initiatives based on lessons: Enhancement of crisis information sharing system



Initiatives based on lessons: Emergency information broadcast system

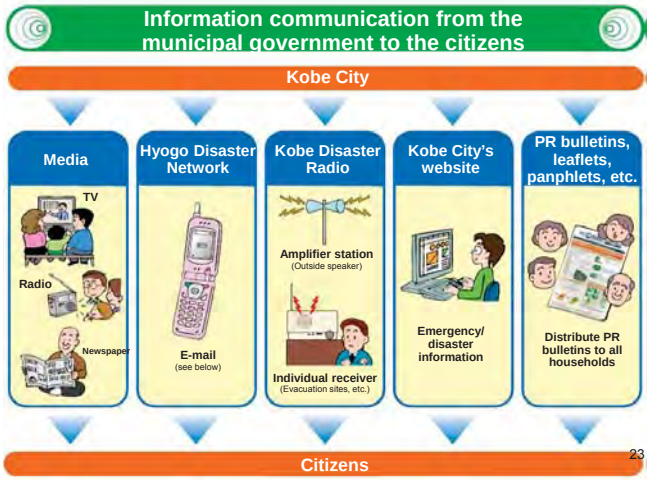
Near JR Motomachi Station

- Outdoor speakers

Pre- 2011 earthquake: 63→End of 2013: 139 in place
(After Great East Japan Earthquake, more added to coastal area & wide area evacuation shelters)

- Radio receivers Around 1,800 in place

Initiatives based on lessons:



City newsletter: "KOBE" Special Edition on Disaster Reduction

River inundation hazard areas, landslide prone areas, evacuation shelters, etc. are shown.

(4) Evacuation shelter management

In the Disaster Management Plan, 364 sites (schools, etc.) were designated as evacuation shelters.
However, the number of planned shelters was not sufficient to accommodate all evacuees.

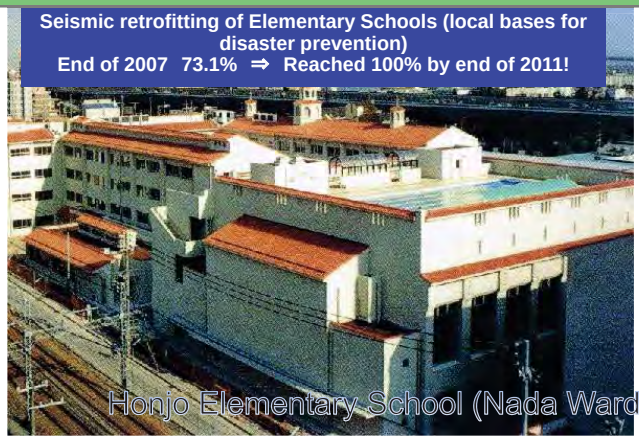
At peak: 599 evacuation shelters (January 26), 236,899 evacuees (January 24)

○Evacuation shelter situation

	No. of evacuation shelters	No. of people staying overnight	No. of evacuees
January 17	497	202,043	98,291
February 17	527	106,050	177,912
March 17	442	62,604	115,541
April 17	391	42,330	55,337
May 17	361	31,132	38,166
June 17	314	21,609	25,960
July 17	283	16,748	18,849
August 17	222	8,491	9,820
August 20	196	6,672	8,140

Initiatives based on lessons:
Local disaster prevention bases (Designated evacuation shelters)

Seismic retrofitting of Elementary Schools (local bases for disaster prevention)
End of 2007 73.1% ⇒ Reached 100% by end of 2011!



(5) Relief supplies

○Inquiries were concentrated within about one week immediately after the occurrence of the Earthquake.
- **Staff dealt with inquiries 24 hours a day.**

○No place for storing tremendous amounts of relief supplies had been determined.
- **Thus, we started searching for warehouses.**

○A chaotic situation occurred as we could not promptly respond to requests for supplies from evacuation shelters.
- **We assigned professional transport operators at warehouses.**

○Gap between needs and the relief supplies that arrived at evacuation shelters
- **There was a time lag until the supplies arrived at evacuation shelters, so large amounts of supplies were not necessary anymore when they arrived, and they were left unused.**

○Distribution bases (4 locations): We dispersed locations for receiving supplies. (January 20–)

	Maya Warehouse	Shin Kobe Warehouse	Silver College	Green Arena Kobe
Location (ward)	Nada	Chuo	Kita	Suma
Opening period	January 20–April 16	January 20–March 7	January 20–August 20	January 20–February 22
Wards in charge	Higashinada, Nada (succeeded by Sumiyoshihama after closing)	Chuo, Hyogo, Nagata (succeeded by Silver College after closing)	Initially Kita Finally Chuo, Hyogo, Kita, Nagata, Suma, Tarumi and Nishi	Suma, Tarumi, Nishi (succeeded by Silver College after closing)

(6) First-aid stations, etc.

○Medical care
- **Installation of first-aid stations (at each evacuation shelter accommodating 1,000 or more disaster victims)**
- **Formation of medical relief teams**
  When there were a small number of medical relief teams, they went around small evacuation shelters.
- **Formation of circulating dental care teams**
  (in cooperation of the neighboring universities, etc.: January 26–March 19)

○Securing of pharmaceuticals and hygiene equipment
- **Relief pharmaceutical accumulation center installed (at the Industry and Trade Exhibition Hall (Sanbo Hall)) (January 22–)**
  Moved to Kobe International Exhibition Hall (February 3–May 17)
  No. of pharmaceuticals delivered: January (467 units), February (597 units), March (182 units), April (47 units)

○Relief supplies
- **Diabetic dietary food, baby food, etc. were delivered to the vulnerable.**

○Volunteer activities
- **Hot meal preparation by dietetic associations, etc. (until the end of March, 37 times (11,345 meals)**

(7) Mortuary care and cremation of the dead

Mortuary situation in 6 wards with high death toll in the urban area

	No. of morgues (max.)	No. of the bodies in morgues (max.)	Remarks
Higashinada Ward	25	1,019	1,318 coffins
Nada Ward	11	749	
Chuo Ward	7	125	
Hyogo Ward	6	421	
Nagata Ward	1	689	
Suma Ward	2	316	

The number of the dead far exceeded the capacity to handle them.

Cremation at funeral halls in the city: Approx. 60%
Cremation at funeral halls outside the city: Approx. 40%

Cooperation with the neighboring local governments beyond the prefectural border is required.

Welfare offices in each ward, in collaboration with the police and other related organizations, conducted installation of morgues, management of the bodies, witnesses for autopsies, procurement, assembly and transportation of coffins, procurement of dry ice, transportation of the dead, etc.

Cremation situation at funeral halls in and outside of the city

Municipal funeral halls	Hiyodorigoe	1,384	Total 2,181
	Seishin	452	
	Konan	345	
Requested from other cities by Kobe City	366		
Requested from other cities by the families of the deceased	Hyogo Pref.	765	Total 1,313
	Other prefectures	548	
Total			3,860

(8) Dealing with the vulnerable

Lessons from the earthquake
- We reaffirmed the limit of rescue activities through public help as well as the importance of mutual help after disaster occurs.
- It is essential to grasp whereabouts of the vulnerable and establish face-to-face relationships in normal times.
- One-fourth of the earthquake-related deaths were caused by pneumonia, so oral care for the elderly is important.

Future initiatives
- To expand the number of districts and organizations engaged in support for the vulnerable in accordance with the ordinance for support of the vulnerable
- To provide information on various support activities according to the actual situation in each community
- To provide human and clerical support for community's support activities
- To establish a face-to-face relationships among community residents and the vulnerable on a daily basis
- To enhance welfare evacuation shelters for the vulnerable
- To implement oral care for health management of the vulnerable (disaster victims)

Example of helping the vulnerable:
"Coming together as a local community to help!"- Uozaki district

- Strategies to help the vulnerable during a disaster

Can you take refuge alone?

Creating a list in each residents' association area of vulnerable people and evacuation shelter helpers (helping each other group) by a showing of hands

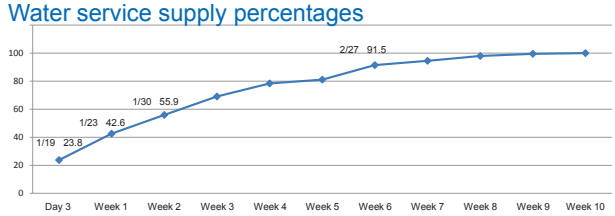
Honing skills through yearly training (checking safety/rescuing/leading the vulnerable to shelters, management and explanation of shelters, food distribution etc.)

Handing down and fostering disaster prevention awareness and the idea of "Local community protecting itself" in the young generation in collaboration with local Elementary and Junior High Schools

Linked to care and support activities in daily life

(9) Progress with emergency water supply and emergency restoration

1. Water service supply percentages

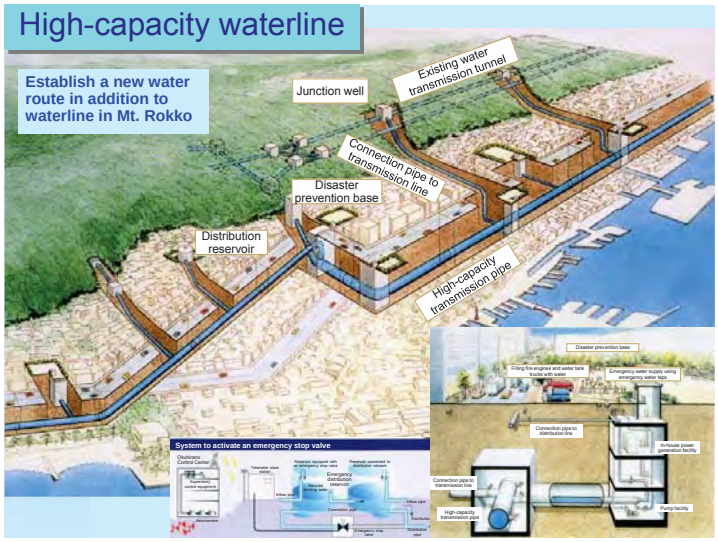


2. Support from other municipalities

(1) Emergency water supply
- At peak (January 25): 804 people from 83 cities and 20 private organizations, 432 water wagons

(2) Emergency restoration work
- Roads: 735 people from 38 cities (February 19); Residences: 272 people from 53 cities (February 24)

High-capacity waterline



(10) Sewage

○Higashinada Sewage Treatment Plant was catastrophically damaged.
- Damage to water channel facilities due to the destroyed revetment
- Processing function completely stopped.

○Damage to culverts, dislocation of connection parts


Temporary closing of Uozaki Canal

"Securing of lifeline"

Emergency measures
⇒ Temporary sedimentation treatment at Uozaki Canal
* Jan. 21– Work commenced.
Feb. 27– Sedimentation treatment commenc
May 1– Secondary treatment of all influent sewage water resumed.
⇒ Securing of flow-down function with temporary pipes


Temporary piping

(11) Roads

- Buildings and houses collapsed over roads.
- Large-scale subsidence, cracking, gaps, etc.


Building collapsed over road (Flower Road)

"Securing roads on which people can walk and vehicles can pass" (for evacuation and emergency transportation)


Large-scale subsidence (Daikai Street)

Measures:
⇒ Securing of the major trunk road functions (5 days later)
⇒ Free traffic of emergency vehicles on toll roads (such as Shin Kobe Tunnel)
(Vehicles with permission were allowed to pass without toll fees for three months after the earthquake.)

(12) Parks

- Evacuation site
- Debris storage place (4 parks)
- Temporary housing (127 parks), etc.

*48% of the park in the disaster-affected 6 wards were used after one week following the earthquake. (Survey by the Japanese Institute of Landscape Architecture)


Temporary evacuation site: Miyamoto Park

"Used for various purposes flexibly as valuable open space"


JGSDF Camp: Shiawase no Mura (Village of Happiness)

Played an important function in recovery.

(13) Promoting seismic retrofitting in homes

- Aim: 95% of homes earthquake resistant by end of FY2015 -

80% of the deaths caused by the Great Hanshin-Awaji Earthquake were within the first 5-15 minutes after the quake, caused by being crushed under collapsed buildings and falling furniture.

In the expected Nankai/East Nankai trough earthquake, slow, large tremors are expected to continue for 1-2 minutes, causing skyscrapers to shake violently.

System to support home seismic retrofitting and securing furniture

Since January 2006, Kobe City has provided financial support for seismic retrofitting and securing furniture, as well as evaluating for free earthquake resistance of buildings whose construction began before May 1981.

(14) Firefighting water sources

■Firefighting water sources
- Due to failure of hydrants and a shortage of fire protection water tanks, firefighting activities could not be sufficiently conducted.

■Reinforcement of firefighting water sources
- In addition to earthquake-resistant fire protection water tanks, enhancement has been made to river water intakes and other water sources.

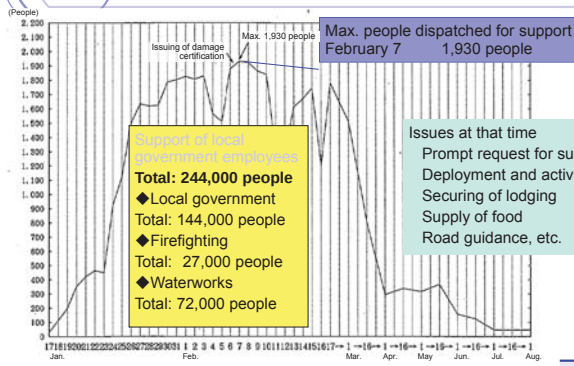
KOBE CITY FIRE BUREAU KOBE CITY FIRE BUREAU KOBE CITY FIRE BUREAU KOBE CITY FIRE BUREAU KOBE CITY FIRE BUREAU

Firefighting

■Firefighting
- The importance of initial response to simultaneous multiple fires was re-affirmed.

■Enhancement of firefighting preparedness
- **A disaster firefighting plan** was formulated to stipulate the **principle of firefighting priority**.
- **10-ton water tank trucks, large-capacity pumpers and hose layers** are deployed to strengthen firefighting capabilities.
- Small motor pumps are deployed for volunteer fire fighters in urban areas.

(15) Support from other municipalities



Max. people dispatched for support
February 7 1,930 people

Support of local government employees
Total: 244,000 people
◆Local government
Total: 144,000 people
◆Firefighting
Total: 27,000 people
◆Waterworks
Total: 72,000 people

Issues at that time
- Prompt request for support
- Deployment and activity
- Securing of lodging
- Supply of food
- Road guidance, etc.

Note: Excluding Fire and Waterworks Bureaus

Volunteer activities

	Kobe City Disaster Management Headquarters (January 18–)	Kobe City Council of Social Welfare (January 30–)	Each ward (after the earthquake)
No. of volunteers accepted	11,500 people	3,248 (people and organizations)	18,570 people
(Re-posting) Breakdown	Medical 1,600 Architecture 210 International relations 280 Other 9,410 (Re-posting) Residents in the city 1,610 Residents outside of the city 9,890	No. of people engaged Total: 39,200 people (Activities) ・Relocation ・Carrying out furniture ・Collecting water ・Sorting and distribution of relief supplies ・Assistance for personal affairs, etc.	Higashinada 7,100 Nada 2,100 Chuo 3,500 Hyogo 1,200 Kita 40 Nagata 2,000 Suma 1,460 Tarumi 500 Nishi 670
	As of March 8, 1995	As of March 31, 1995	As of August 15, 1995

・Initial confusion
A system for dealing with volunteer activities had not been established.

Initiatives based on lessons: Support (lessons)

Formulation of the plan for receiving outside support (March 2013)

- The plan was formulated with the aim of utilizing support from other municipalities and volunteers to the maximum extent possible.
- The plan was prepared as a sub-plan of the city's disaster management plan (first in Japan).
- The plan is based on the assumption of an earthquake equivalent to the Great Hanshin-Awaji Earthquake and a period of approximately one month.
- A sheet for receiving outside support and the workflow for 130 work activities (including routine duties) are prepared.
- Priority is given to the following perspectives: (1) information processing, (2) command coordination, (3) environment for on-site measures, (4) development of cooperative relationship with private sector

Background and purpose of formulation of the plan for receiving outside support

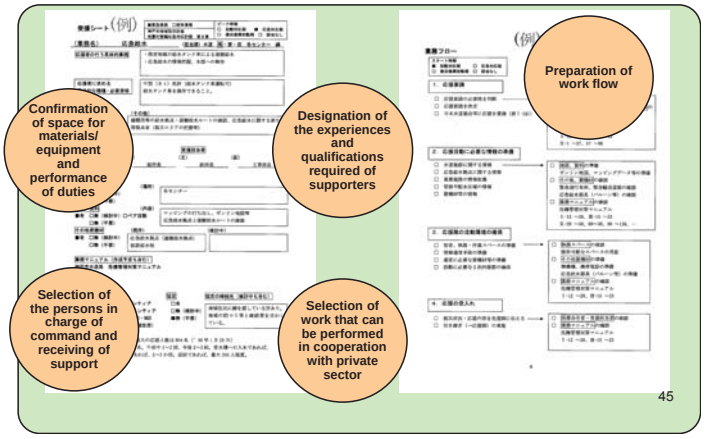
Great Hanshin-Awaji Earthquake (receiving party)

Great East Japan Earthquake (supporting party)

Experiences and lessons

Formulation of the plan for receiving outside support

Sheet for receiving support and work flow



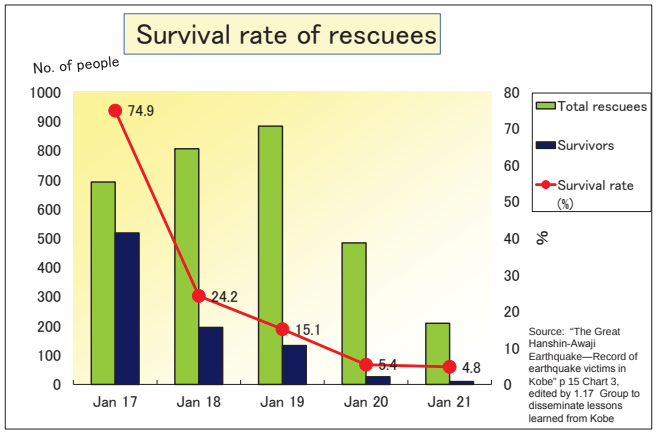
(16) Supporting local "Bokomi" community activities

Lessons learned from the earthquake

- "Protect your own life"(Self help)
- "Help each other" (Mutual help)
- "Improve the ability of communities to come together to solve their issues"

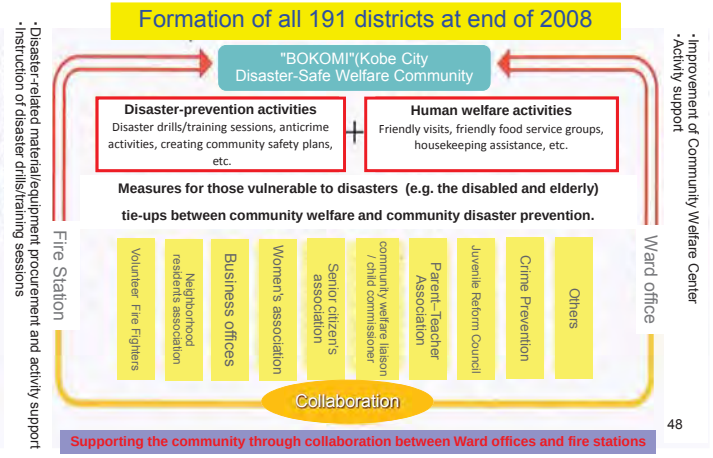
Help during a disaster
70% Self help, **20% Mutual** help, **10% Official** help

Protecting our own community by ourselves



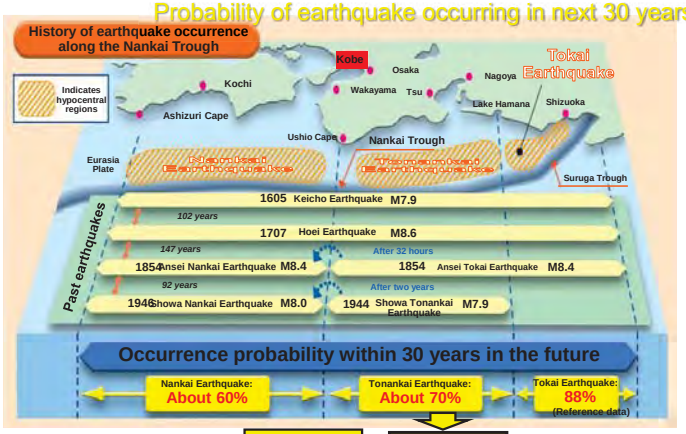
"Bokomi" communities
(divided into Elementary School districts)

Formation of all 191 districts at end of 2008



III. Nankai Trough Earthquake

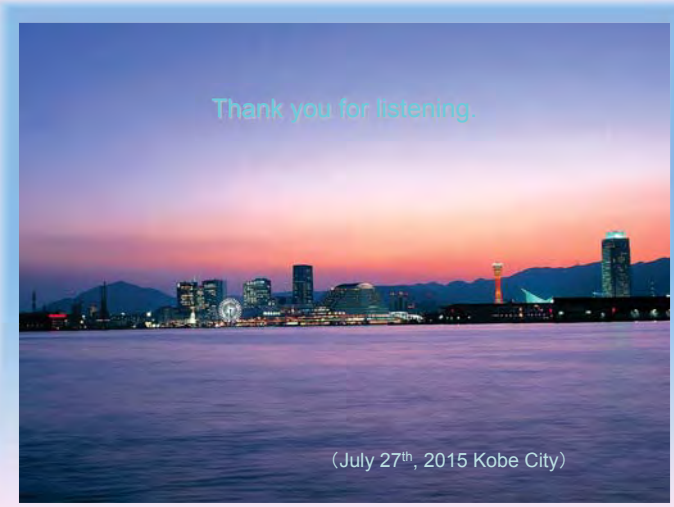
Probability of earthquake occurring in next 30 years



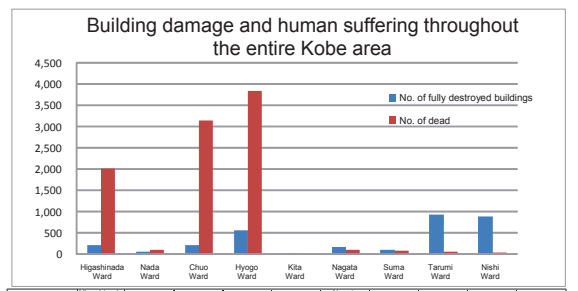
(The Headquarters for Earthquake Research Promotion)

(1st Jan 2013 standard)

70～80%



Damage estimates: Nankai Trough massive earthquake and tsunami in Hyogo Prefecture (released on June 3, 2014)

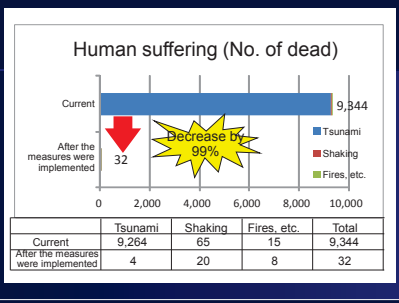


	Higashinada Ward	Nada Ward	Chuo Ward	Hyogo Ward	Kita Ward	Nagata Ward	Suma Ward	Tarumi Ward	Nishi Ward	Total
No. of fully destroyed buildings	217	50	203	555	8	174	89	927	886	3,109
No. of dead	2,012	101	3,137	3,834	0	95	86	46	33	9,344

[Damage overview] (compared to the Great Hanshin-Awaji Earthquake)

- Building damage (6 p.m. in the winter): Fully destroyed buildings: 3,109 (0.04 times (74,386 buildings))
- Human suffering (Noon in the summer: 9,344 people dead (2.04 times (4,571 people))

Damage estimates: Nankai Trough massive earthquake and tsunami in Hyogo Prefecture (released on June 3, 2014)



	Tsunami	Shaking	Fires, etc.	Total
Current	9,264	65	15	9,344
After the measures were implemented	4	20	8	32

[Disaster reduction measures (tsunami measures)]

- Strengthening of tide embankment: Ensure closing of gate doors that are resistant to tsunami overflow.
  ⇒ A certain extent of structural measures for disaster mitigation
- Prompt evacuation: Early evacuation rate (70% → 100%)
  ⇒ Non-structural measures based on evacuation

IV. New initiative

Kobe Tsunami Web Service

Kokokuru?

Starts on May 1, 2014!

http://kokokuru.jp

Disaster Waste Management

神戸市環境局環境政策部

Disaster Waste Management

- Disaster Waste Management following the Great Hanshin-Awaji Earthquake
- What is Disaster Waste?
- Basic Policy for Disaster Waste Management
- Disaster Emergency Response

July 27, 2015

Environmentally Friendly City Promotion Office,
Environment Bureau, Kobe City
Shinichi Kaneko

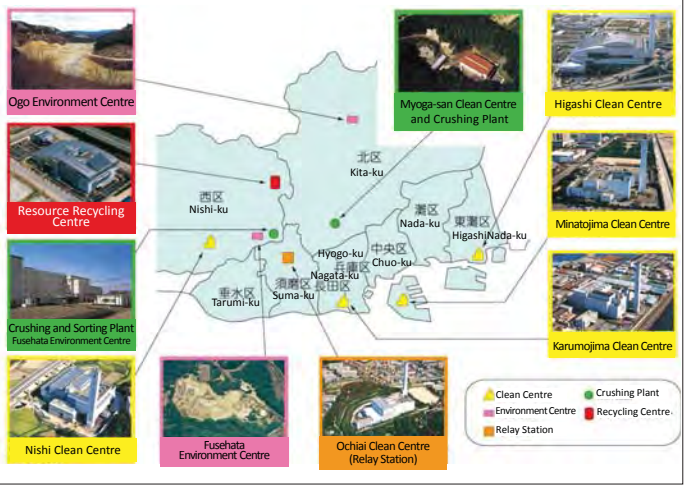
Disaster Waste Management following the Great Hanshin-Awaji Earthquake

Temporary Storage Site at the Fusehata Environment Centre

Waste trucks on the congested roads

Accumulated disaster waste

Disaster Waste Management following the Great Hanshin-Awaji Earthquake



Disaster Waste Management following the Great Hanshin-Awaji Earthquake

Operations at the Fusehata Environment Centre

Spontaneous combustion

Carrying out metal waste

Temporary storage of woody debris

Disaster Waste Management following the Great Hanshin-Awaji Earthquake

- A large amount of disaster waste was generated by the earthquake (8.035 million tonnes)
- Damaged Clean Centres (CC) stopped incineration operations

⇒<u>The waste exceeded their regular capacity of 2,790 tonnes per day.</u>

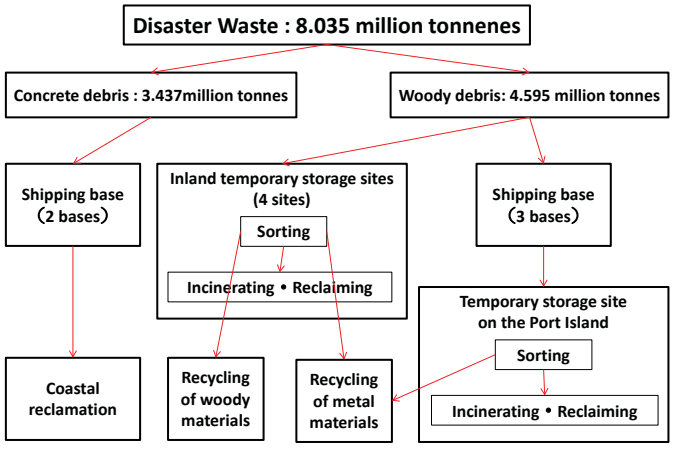
【Countermeasures】
- Establishing temporary storage sites
  (4 sites in the inland area and 1 on the Port Island)
- Swift recovery of Clean Centres
  2 sites resumed in January
  3 sites resumed in February

Disaster Waste Management following the Great Hanshin-Awaji Earthquake

Operations at the Oga Temporary Storage Site

Incineration Furnace & Crushing and Sorting Facility

Disaster Waste Management following the Great Hanshin-Awaji Earthquake



Disaster Waste Management following the Great Hanshin-Awaji Earthquake

- Large amount of human waste
  → Deterioration of sanitary environment
- Environmental Pollution by hazardous materials

⇒Preservation of citizen's safety and sanitary environment was a matter requiring immediate attention.

【Countermeasures】
- Increasing storage of human waste
  Takamatsu Office +
  Tarumi Sewage Treatment Plant & Port Island Sewage Treatment Plant
- Monitoring of atmospheric & water environment
- Planning of basic policy and guidelines for asbestos management

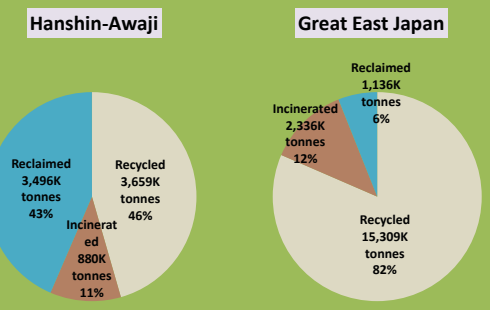
Basic Policy 1) Instructing to building demolishers
2) Providing information to building owners
3) Implementing measures to treat asbestos at public expense at demolition sites
4) Environmental monitoring of asbestos
5) Promoting non-asbestos construction to new buildings

What is Disaster Waste?

- **Waste generated by a disaster**
- Main features of disaster waste
  - ① Waste temporarily generated in a large quantity
  - ② Mixed waste of combustible and noncombustible
  - ③ Most waste is noncombustible such as concrete and sand

Basic Policy for Disaster Waste Management

After the Great East Japan Earthquake, more than 80% of disaster waste is recycled to public infrastructure including construction and maintenance of parks, reclamation of ports and harbours, recovery of coastal disaster prevention forests and embankments.

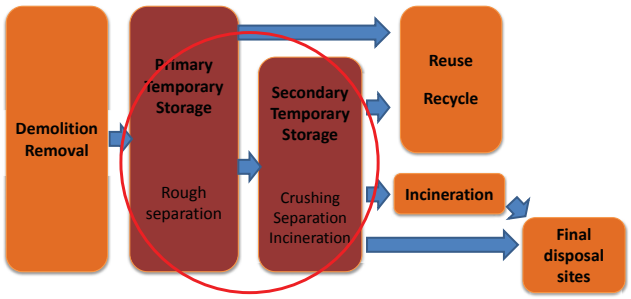


What is Disaster Waste?

Type	Outline
Waste concrete	Concrete pieces, asphalt pieces
Scrap metal	Steel frames, reinforcement bars, aluminum materials
Waste wood	Poles, joists, walls, driftwood from tsunamis
Home appliances	TVs, washing machines, air conditioners
Vehicles	Automobiles, motorbikes, scooters
Ships	Damaged vessels
Noncombustible	Pieces of concrete and glass which are difficult to sort Noncombustible waste mixed with soil
Combustible	Mixed waste with fiber, paper, and woods

Basic Policy for Disaster Waste Management

- Flow Chart of Basic Disaster Waste Management Measures



What is Disaster Waste?

Type	Outline
Perishable waste	Ingredients and products generated from factories of fish, food, seafood, feed and fertiliser
Tsunami sediments	Deposits of earth, sand, and sludge from the seabed washed up on the shore by tsunamis Soil from agricultural lands caught in tsunamis
Hazardous waste	Solid waste containing asbestos, PCB, infectious waste, chemical substances, medicines, agricultural chemicals
Waste that is difficult to treat appropriately	Fire-extinguishers, hazardous materials such as a gas cylinders, pianos, mattresses, fishing nets, plaster boards

Basic Policy for Disaster Waste Management

Disaster Prevention（Damage suppression, Damage mitigation）

Plan the arrangement of temporary storage sites and widespread management of disaster waste in order to ensure an effective emergency response system when a disaster occurs.

Disaster Emergency Response

Understand the situation of disaster waste management, immediately consider how to coordinate and what kinds of materials and equipment to request, and specify effective measures.

Source：Guidelines for Disaster Waste Management, March 2014, MOEJ

Basic Policy for Disaster Waste Management

- Overwhelming lack of capacity to manage waste in damaged areas
- It is **very difficult to secure sufficient final disposal space** especially when a huge disaster occurs
- **Establishment of temporary storage sites** and **full promotion of sorting and recycling of disaster waste** are necessary to mitigate the temporary burden on waste management plants (crushing and sorting plants, waste incineration plants, and final disposal sites) as well as to smoothly manage an enormous amount of disaster waste.
- From the viewpoint of necessity of implementing urgent measures to manage disaster waste, it is crucial to **take recycling into consideration from the earliest stage of management** and **thoroughly sort disaster waste**.

Disaster Emergency Response

Treatment Schedule

Demolition and removal of damaged buildings

Collection and transportation

Temporary Storage Sites

Source：Guidelines for Disaster Waste Management, March 2014, MOEJ

Disaster Emergency Response

Treatment Schedule

Special treatment schedule should be planned based on standard treatment procedures and be in accordance with the actual situation of damage caused by the disaster

① Confirm the status of damage to government officials
② Volume of disaster waste
③ Treatment capacity based on a consideration of the status of damage to disposal sites

Matters of high urgency

① Removal of obstacles on roads
② Treatment of human waste in temporary toilets
③ Collection of hazardous waste and dangerous waste
④ Demolition and removal of buildings with a high possibility of collapse
⑤ Treatment of perishable waste

Source：Guidelines for Disaster Waste Management, March 2014, MOEJ

Disaster Emergency Response

Temporary Storage Sites

・Establish temporary storage sites after coordinating with other relevant authorities, because empty land may also be selected for other uses such as a base for the Self-Defense Force or a temporary residential area.

・Prevent disaster waste from scattering by wind if temporary storage sites are in a place with strong winds, such as harbours and ports. (Sprinkle water, and set a scattering prevention net and fence)

・To prevent sewage water from permeating into the soil, temporarily cover storage sites with concrete, set an iron plate over the site and drainage ditches, in order to prevent water and soil pollution in public areas.

Source：Guidelines for Disaster Waste Management, March 2014, MOEJ

Disaster Emergency Response

Dismantling and removal of damaged houses

・Confirm the status of the use of asbestos to construction materials prior to disaster, and inform relevant entities in order to prevent asbestos from mixing with other waste.
・Remove disaster waste effecting transportation, and prioritise demolishing and removing buildings with a high possibility of collapse. Except for emergency, when removing, do not crush the materials into very small pieces as this creates difficulties in recycling.

Source：Guidelines for Disaster Waste Management, March 2014, MOEJ

Disaster Emergency Response

Sorting at Primary Temporary Storage Sites

Perform rough separation by heavy machines and human labour in order to implement an effective intermediate treatment at secondary temporary storage sites.

Rough separation of mixed waste

Separation by human labour

Disaster Emergency Response

Source：Guidelines for Disaster Waste Management, March 2014, MOEJ

Disaster Emergency Response

Waste Plastic (PVC pipes)

Mattresses, Pianos

Slate

Tatami Mats

Disaster Emergency Response

Collection and Transport

・ Let volunteers be aware of issues in sorting disaster waste from damaged houses

・Separate disaster waste from houses destroyed by fire from other waste due to a high risk of contamination of hazardous material

・Prioritise the collection of hazardous waste, dangerous waste, and perishable waste.

・Decide waste collection routes from a general viewpoint considering the effect on the living environment of local people and the prevention of traffic jams

Source：Guidelines for Disaster Waste Management, March 2014, MOEJ

Sewerage System in Kobe

神戸市建設局下水道部

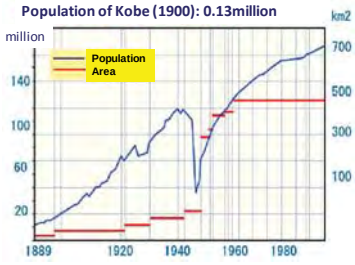
Sewerage System in Kobe

Higashi Water Environmental Center,
Construction Bureau, Kobe city

Kobe in the 1900s

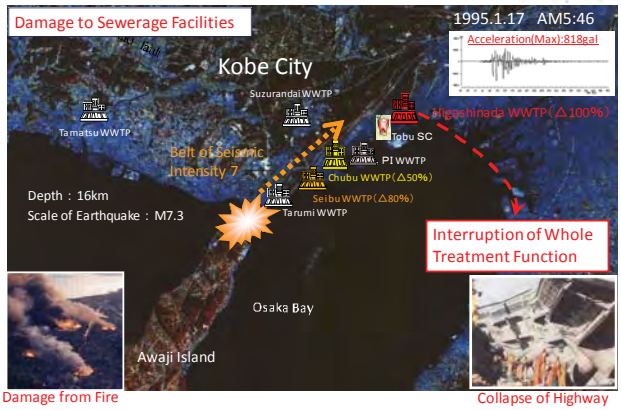
- Vast farmlands around Kobe
- Use of manure as a valuable product

Population of Kobe (1900): 0.13million



Agricultural use of night soil

Great Hanshin-Awaji Earthquake



Damage from Fire

Collapse of Highway

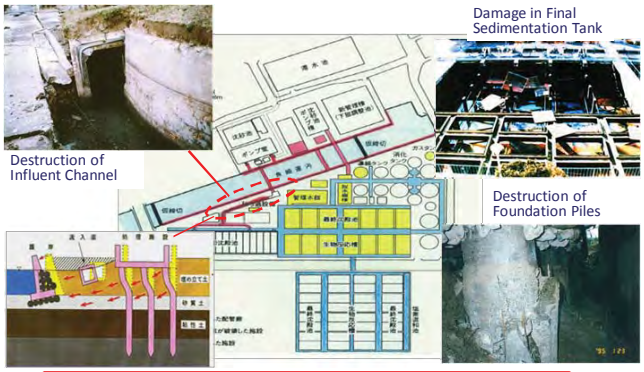
Kobe in the 1960s

Water pollution caused by rapid economic growth

Population increased rapidly (about 1.1 millions). So, disposal problems such as ocean disposal occurred.

Hyogo Canal (called 'The death canal')

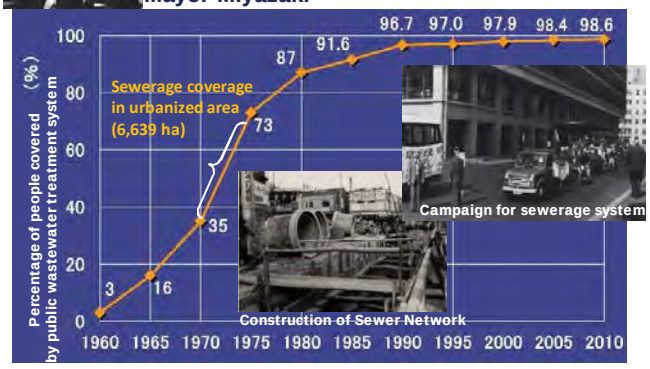
Situation of Damages at Higashinada WWTP



The largest WWTP of the city (daily effluent volume: 160,000m³/day) was out of commission for 100 days.

Sewerage System in Kobe

Mayor Miyazaki

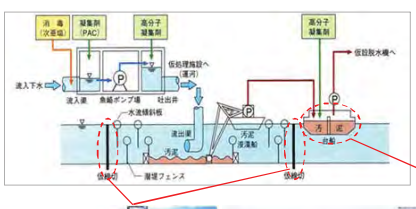


Campaign for sewerage system

Construction of Sewer Network

Emergency Restoration ～Primary Treatment～

For around 100 days, sediment treatment carried out inside the canal



- Method of Treatment : Primary Treatment
- Sedimentation Tank : Width 40m × Length 300m
- Change of effluent quality (1/19⇒3/20)
  COD : 112⇒50mg/L
  SS : 110⇒50mg/L
  Coliform Level : 44,000⇒850cfu/cm³

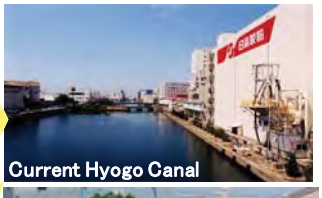
Temporary Closing

The Whole View of Uozaki Canal

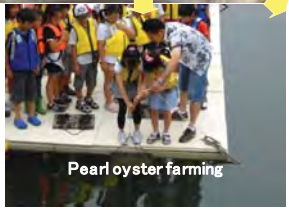
Sludge Thickening Facilities

Improvement of water quality -Hyogo Canal revived-

Hyogo Canal in 1964



Current Hyogo Canal



Pearl oyster farming

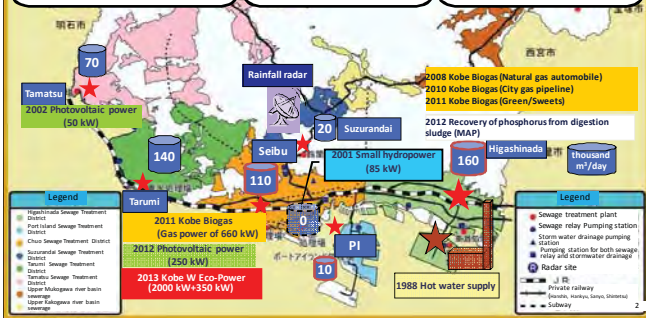
Rafting race (rafts made of PET bottles)

Master Plan of Sewerage System in Kobe

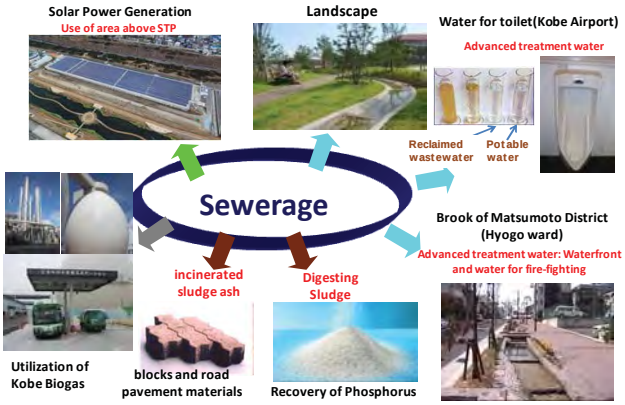
History
1951 (Start of development of sewer network)
1958 (Establishment of Chubu Treatment Plant)
1995 (Great Hanshin-Awaji Earthquake)
2008 (Kobe Biogas)

Current states
- Sanitary sewer: About 4,050 km
- Storm sewer: About 650km
- Population coverage: 98.7%
- Sewage treatment area: 17,000 ha
- Population: About 1.54 million

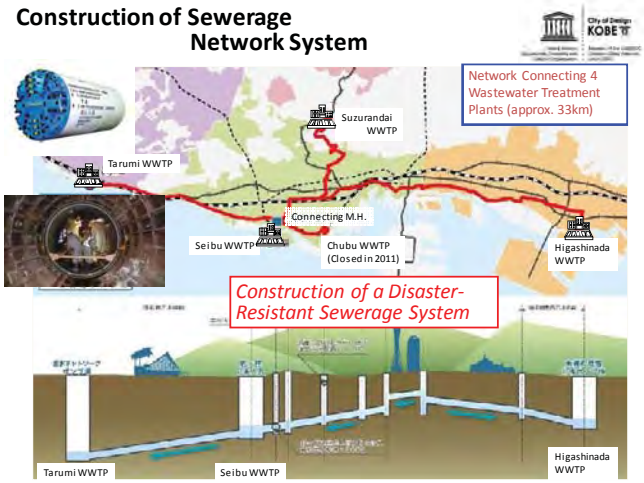
Main facilities
- Sewage treatment plant: 6 locations
- Sludge center: 1 location
- Pumping station: 23 locations
- Rainfall radar site: 1 location



Examples of Utilization of Sewage Resources



Construction of Sewerage Network System



Outline and Background of Utilization of Sewage Resources

- 1995 Great Hanshin-Awaji Earthquake (This plan was damaged heavily)
- 2004 Joint research on production of bio natural gas from digestion gas started
- 2008 Bio natural gas supply service for natural gas vehicles started
- 2009 City Gas Mains Injection Project started (Injection of highly-refined Kobe Biogas into the Osaka Gas pipeline)
- 2011 Kobe Green/Sweets Project (Acceptance of regional biomass to increase the amount of Biogas)
- 2012 Kobe Harvest Project (Recovery of phosphorus from digestion sludge

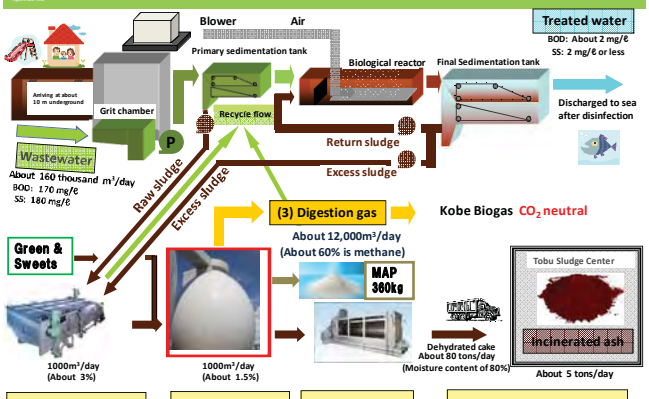
About Higashinada STP

- Operation start: 1962: Current processing capacity: 241,500 m³/day
- Site area of STP: 17 hectares (The canal flows across this sewage plant)
- Sewage treatment area: About 3,500 hectares
- Population covered by the STP: 380 thousand people (The average amount of treated water is about 160 thousand tons.)

11

Egg shape Digestion tanks

Sewage and Sludge Treatment Flow at Higashinada STP

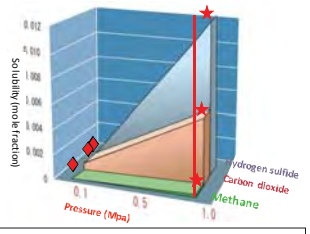


12

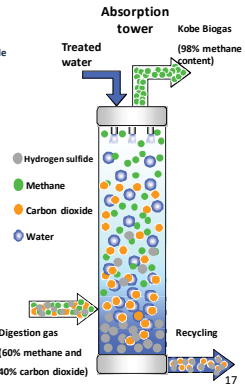
KOBE Biogas refining facility

High-pressure Water Absorption Method

- Refining is done using a difference in solubilities of gases in water.
- Can be refined to achieve a 98% methane content.
- A low running cost can be achieved and the treated water can be utilized.
- Both hydrogen sulfide and carbon dioxide can be eliminated using a simple mechanism.
- Siloxane can be eliminated simultaneously.



When the pressure rises, the solubility of hydrogen sulfide and carbon dioxide in water rapidly increases but that of methane scarcely changes.



Outline and Background of City Gas Mains Injection Project (Supply further refining Kobe Biogas to city gas)

● Back ground
- Kobe city: 100% utilization of digestion gas (surplus gas)
- Osaka gas: City gas companies were obliged to comply with purchasing non-fossil energies by Act

'Sophisticated Methods of Energy Supply Structures' was enacted.
To oblige specific energy suppliers to comply with utilization of non-fossil energies and effective utilization of fossil energy sources.

2009 | 2010 | 2011 | 2012 | 2013 | 20 | 2019 | 2020

● 'Sophisticated Methods of Energy Supply Structures' enacted (July)
● Demonstration facilities construction start (August)
● Injection to City gas pipeline start (October)

● Roles and Present Status of Verification Project

< Roles : Joint research of 'Kobe city', 'Kobelco-Eco-Solution' and 'Osaka gas' >

(1) Kobe city: Supply Kobe Biogas to Kobelco Eco-Solution
(2) Kobelco Eco-Solution: Inject refining Kobe Biogas to City Gas Pipelines
(3) Osaka Gas: Supply refining Kobe Biogas to Households

< Present Status in 2013>

Further refining Kobe Biogas is supplied to 3,000 households - 3,000m³ a day- .
Reduce 1,800 ton of carbon dioxide by using Kobe Biogas as city gas per year.

Facilities for Utilizing Kobe Biogas

(2) Medium-pressure gas tank
1500 m³, two tanks
(Gas Business Act)

(1) Refining facilities
330 m³/hour, 2 systems
(volume of digestion gas)

(3) Kobe Biogas Station
(High Pressure Gas Safety Act)

Acceptance criteria of City Gas by Osaka Gas

Digestion gas (just after production)	Property	Kobe Biogas	Acceptance criteria by Osaka Gas Co., Ltd.	Unit
59.7	Methane	98.2	None	Percent by volume
37.0	Carbon dioxide	0.6	≦0.5	Percent by volume
0.4	Oxygen	0.2	≦0.01	Percent by volume
0.8	Nitrogen	1.0	≦1.0	Percent by volume
330	Hydrogen sulfide	< 0.1	≦0.65	ppm
14.53	Siloxane	0.005 or less	Individual consultation	mg/Nm³
23.8	Higher calorific value	39.3	45.0	MJ/Nm³
None	Odorant	THT	TBM-DMS	mg/Nm³

THT (tetrahydrothiophene) TBM-DMS(tertiary-butylmercaptan - dimethly sulfide)

● Properties by which Kobe Biogas does not meet the conditions to be injected to the pipeline.

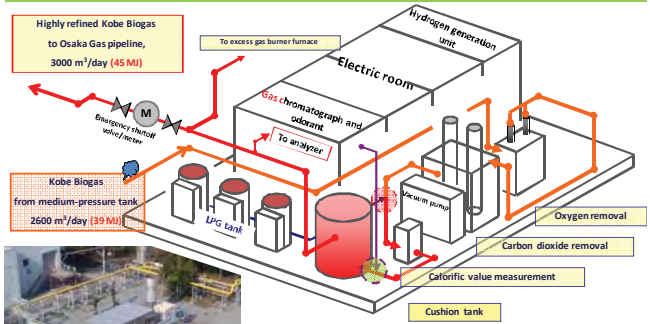
Natural gas vehicles which refuel at Kobe biogas station

High-pressure gas tank
60ℓ x 2 (19.6MPa)

Filling a car once allows it to run for about 200 km.

City bus being filled with Kobe Biogas

Facilities for Injection to City Gas Pipeline

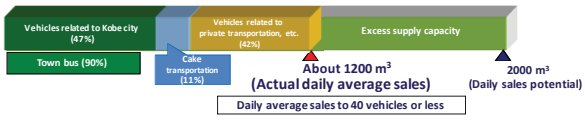


Kobe Biogas Station Sales Status

● Kobe Biogas selling prices (comparison of prices)

	Calorific value	Selling price	Price per calorific value
Kobe Biogas	39.2 MJ/m³	JPY 85/m³	JPY 2.2/MJ
Natural gas	45.0 MJ/m³	JPY 150/m³	JPY 3.3/MJ
Gasoline	34.6 MJ/ℓ	JPY 160/ℓ	JPY 4.6/MJ
Light oil	38.2 MJ/ℓ	JPY 130/ℓ	JPY 3.4/MJ

● Recent selling status of Kobe Biogas Station (actual daily average in fiscal 2012)



● Recent registration status of Kobe Biogas Station (160 vehicles in total as of March 2013)

Outline and Background of "Kobe Green Sweets Project"

● Back ground
- Utilization of unused regional biomass
- Increase the amount of Kobe biogas

(Decrease in the emissions of greenhouse gas)

● Aim
- Select regional biomass suitable for sewage sludge digestion process
- Increase in the amount of biogas (due to mainly sweet biomass intake)

※ Production of Kobe Biogas for about 5,000 general households is pursued.

- Improvement of sludge dewatering ratio and reduction in incineration fuel (due to mainly green biomass intake)
- Designation of Japanese biogas standard

2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019

● Green Sweets Project start (September)
● Sweets intake start (July)

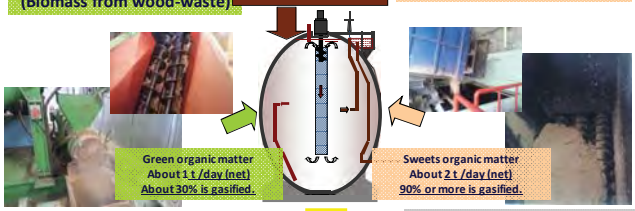
Breakthrough by Dynamic Approach in Sewage High technology Project

Green/Sweets Acceptance Targets Suitable for Sewage Sludge: Higashinada STP

Green: 4 t /day
(Biomass from wood-waste)

Sewage sludge:
1000 m³/day
Sewage solid: About 30 t /day

Sweets: 11 t /day
(Biomass from food waste)



Green organic matter
About 1 t /day (net)
About 30% is gasified.

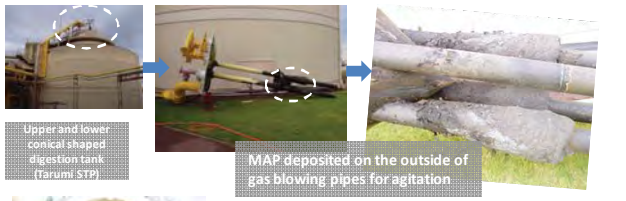
Sweets organic matter
About 2 t /day (net)
90% or more is gasified.

Lumber from thinning in Mt. Rokko
Pruned branches of park and roadside trees

Waste from food production processes

Anaerobic methane fermentation in digestion tanks
Production of Kobe Biogas for about 5,000 general households is pursued.

Magnesium Ammonium Phosphate (Used for Phosphorous Fertilizer) (Kobe Harvest Project)



Upper and lower conical shaped digestion tank (Tarumi STP)

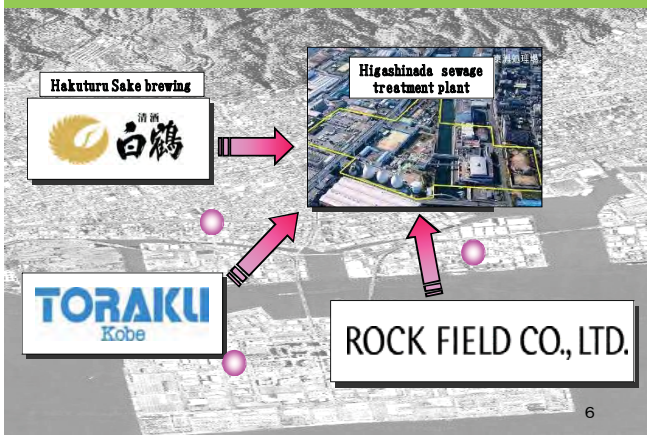
MAP deposited on the outside of gas blowing pipes for agitation

MAP is also deposited inside the sludge piping

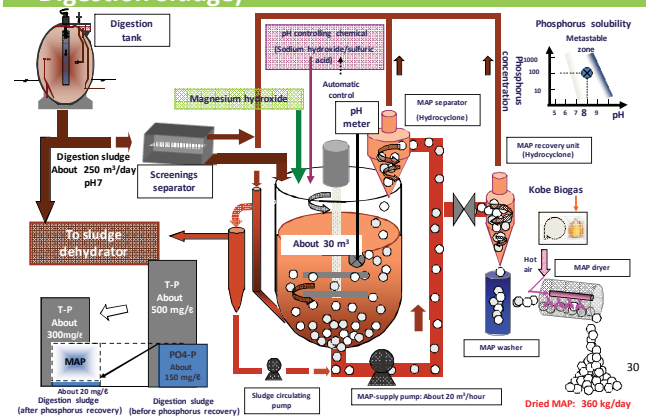
MAP recovered from digestion sludge

Compound phosphorus fertilizer (using MAP)

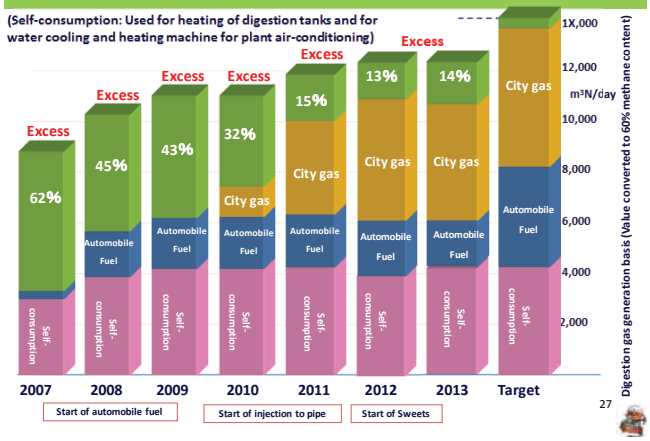
Regional biomass suitable for sewage sludge



Phosphorus removal and Recovery System (from Digestion Sludge)



Higashinada STP: Digestion Gas Utilization Status



7th/Apr/2015 We performed a news release -----
-----The examination cultivation of the sweet corn bigins in Kobe using the organic fertilizer contains phosphorus collected from digestion sludge!

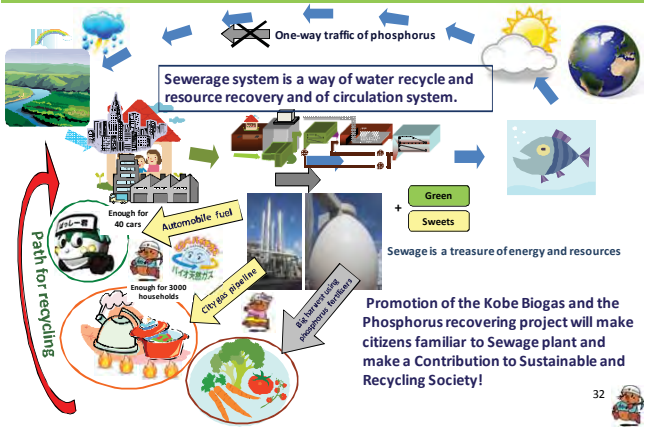
Outline and Background of "Kobe Harvest Project"

- **Back ground**
  - Phosphorus is the depleting resources worldwide.
  - Prevention of red tide in the closed water area (Osaka bay)
  - Much phosphorus gathers to the sewer
    (Called phosphorus mine in city)
  - Prevent sludge pipes from becoming clogged with phosphorus
- **Aim**
  - Recovery phosphorus from digesting sludge efficiently
  - Make use of phosphorus as raw materials of fertilizer
    (Kobe Brand cyclical form fertilizer)

● Demonstration facilities construction start (June)
● Phosphorus recovery test run start (February)

Breakthrough by Dynamic Approach in Sewage High technology Project

Resource Circulation System of the Sewerage



Promotion of the Kobe Biogas and the Phosphorus recovering project will make citizens familiar to Sewage plant and make a Contribution to Sustainable and Recycling Society!

Aiming familiar STP with local residents

Almond flowers are in full bloom around the end of March
And "Almond Tree and Spring Music Festival" is held every year

ISAP2015 発表資料

- ISAP2015: Resilient Cities –Discussion Point- (Toshizo Maeda)
- Enhancing Capacities for Building Climate and Disaster Resilient Cities: Lessons Learned from Asian Cities (D. G. J. Premakumara)
- Planning a Disaster-Resilient City in Cebu, Philippines (Nida C. Cabrera)
- Planning Flood Resilient City in Nonthaburi, Thailand (Pornsri Kictham)
- Planning Climate and Disaster Resilient in Ho Chi Minh City (Nguyen Trung Viet)
- Study on How to Build a Disaster Resilient City in Shanghai, China (Qunfang Hu)
- Building Resilient Cities in Asia: A Training Workshop in Kobe

ISAP 2015: Resilient Cities

Discussion Points

Toshizo Maeda
Director, Regional Centre in Bangkok

IGES Institute for Global Environmental Strategies

Frameworks for Disaster Risk Reduction (DRR)

Hyogo Framework for Action 2005-2015: Priorities for Action

1. Ensure that DRR is a national and a local priority with a strong **institutional** basis for implementation
2. Identify, **assess** and monitor **disaster risks** and enhance early warning
3. Use knowledge, innovation and **education** to build a culture of safety and resilience at all levels
4. **Reduce** the underlying **risk** factors
5. Strengthen disaster **preparedness** for effective response at all levels

Sendai Framework for Action 2015-2030: Priorities for Action

1. **Understanding disaster risk**
2. Strengthen disaster risk **governance** to manage disaster risk
3. **Investing in disaster risk reduction** for priority understanding disaster risk **resilience**
4. Enhancing disaster **preparedness** for effective response and to **<Build Back Better>** in recovery, rehabilitation and reconstruction

10 Essentials for Making Cities Resilient

1. Put in place **organisation and coordination** to understand and reduce disaster risks
2. **Assign a budget** for DRR
3. **Prepare risk assessments** and use these as the basis for urban development plans and decisions
4. Invest in and maintain **critical infrastructure** that reduces risk
5. Assess the safety of all schools and health facilities
6. Apply and enforce **realistic, risk compliant building regulations and land use planning principles**
7. Ensure that **education programmes and training** on DRR are in place in schools and local communities
8. **Protect ecosystems and natural buffers** to mitigate floods, storm surges and other hazards
9. Install early warning systems and emergency management capacities in your city
10. After any disaster, ensure the **needs of the affected population are placed at the centre of reconstruction**

Source: "How to Make Cities More Resilient: A handbook For Local Government Leaders", UNISDR, GFDRR

Typical Questions

- What are the main **risks**?
- What changed most **before and after** the disaster?
- What are the **traditional / local knowledge** related to past disasters? Do you have an institution / exhibitions to memorize that?
- What are the recommendable **public education** / awareness raising activities? Do you use hazard maps or any other tools? Do you any campaigns engaging the media?
- **Early warning system:** How much has it been established in your city? Do you have a GIS mapping / baseline analysis / monitoring system?
- **Land use plan, urban planning, building codes,** housing policies, neutral buffers: How these can be really changed / implemented?
- **Infrastructure needs:** What do you need most to reduce the disaster risks?
- What did you pick up from the **Kobe** study visit? Anything applicable?

Nonthaburi City: The Great Flood 2011

- Along Chao Phraya River (37km from the sea); **MSL +1.00-3.00m**; surrounded by canals (L=51.9km); 41 pumping stations (75m3/s)
- Road along the River: **MSL +2.75m** (> 2.70m: historical flood)
- Maximum flood level: **MSL +3.19m** (...raised the river dike to **MSL +3.50m for 26.7km length** (=11km+ 4km + 6km + 5.7km))
- **Piling 40,000 sand bags per day**; 1,000-2,000 volunteers for 45 days (need for water, lunch, dinner, late night meal)
- **Total 2 million sand bags**; 28,000m3 of sands; 1,600kg of waterproof plastic sheets; 5 backhoes, 37 trucks, 70 pumps ... Costing THB 78m (purchased by cash only)
- Contribution from other municipalities, private companies, others
- **Protected 95% of the area (110,000 hhs);** 5% (5,000 hhs) were inundated; (but 40% of city officers were affected); 5 schools as temporal shelters; Relief aid THB 25,000/family (total THB 43m)

Nonthaburi City: The Great Flood 2011 (cont.)

- Urgent project to prevent from Chao Phraya River flooding: THB 3.4B (=JPY 12B) (study results by a consulting company)
  - Embankment of river banks and canals: THB 2.6B (=JPY 9.1B)
  - Improving pumping stations: THB 0.2B (=JPY 0.7B)
  - Constructing a drainage system: THB 0.6B (=JPY 2.1B)

Enhancing Capacities for Building Climate and Disaster Resilient Cities:

Lessons Learned from Four Asian Cities

ISAP 2015, 29 July in Yokohama
PL-7: Approaches by Asian Cities to Build Resilient Cities

D.G.J.Premakumara, Toshizo Maeda, Jian Huang, Shiko Hayashi, Shom Teoh, KUC/BRC

Introduction: planning resilient cities

- Rapid urban growth, climate change and natural disasters pose a huge risk to quality of life, economic and social stability of cities, especially in developing countries where one out of seven people are living in informal urban settlements (IPCC, 2012; Mitlin and Satterthwaite, 2013).
- Understanding risks and building resilient cities is therefore critical than ever before and international development community is negotiating important frameworks and agreements to address them (e.g. the Sustainable Development Goals (SDGs), the new United Nations Framework Convention on Climate Change (UNFCCC) and the post 2015 framework for Disaster Risk Reduction (DRR) .


Indian Ocean Tsunami in Sri Lanka, 2004


Typhoon Yolanda in Philippine, 2013

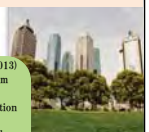

Floods in Thailand, 2011


Earthquake in Nepal, 2015

Photos: https://www.google.co.jp/search?

Aims of the study

IGES is involved in reviewing the experience of four Asian Cities **(Cebu, Nonthaburi, Ho Chi Minh, Shanghai)** and identify progress, challenges and key recommendations in planning and implementation of resilient cities.



Shanghai

- Population: 24.4 million (2013)
- Density: 3,800 person/sq.km
- The largest Chinese city is also largest city by population in the world
- Vulnerable to both natural and man made disasters
- Cyclones, floods, un-planned high-rise development and energy constraints

- Population: 257,742 (2012)
- Density: 6,626 person/sq.km
- Located next to Bangkok, it is one of the fast growing economic, trade and social hub in the Central Region
- Vulnerable to storms, floods, food security and energy

Nonthaburi

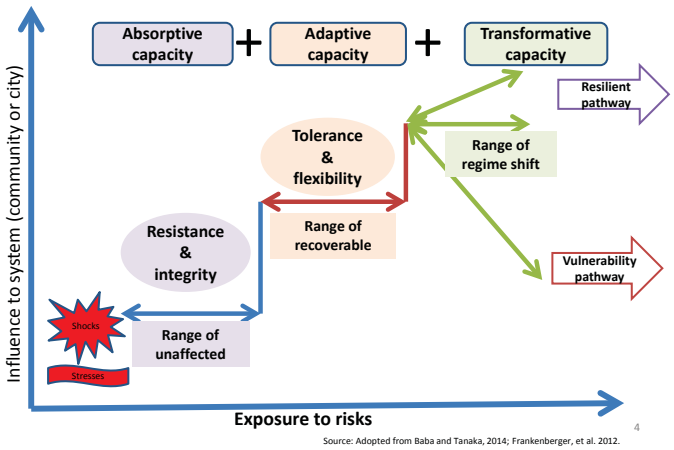
Ho Chi Minh

Cebu

- Population: 8.1 million (2014)
- Density: 3,909 person/sq.km
- The largest economic center in Vietnam
- A tropical coastal city located on the estuary of Saigon-Dong Nai River, is regularly flooded due to a combination of tides, storms, rains, and man made structures.

- Population: 866,171 (2010)
- Density: 7,753 person/sq.km
- The second largest growth center in the Philippines
- Vulnerable to floods, typhoon, landslides, and fires

Analytical framework: resilient city building



Source: Adopted from Baba and Tanaka, 2014; Frankenberger, et al. 2012.

Research methodology

Phase 1 (2013-2014): Risks and capacity assessment
- Engaging the city (select case study city, briefing local leaders/stakeholders, and formation of technical group)
- Conduct the climate/ disaster risk and capacity analysis *(focus group discussion and key informant interviews)*

Phase 2 (2014-2015): Formulation of resilient measures
-Development of measures and strategies for building resilient city *(focus group discussions and city consultation)*
- Organise training and capacity building for city officials

Phase 3 (2015-2016): Evaluate, lessons learned and policy adaptation
- Ensure political support to integrate resilient measures into local policies and development plans
- Networking and knowledge sharing with other cities and international platforms


Focus group discussions for risk assessment in Cebu, Jan 2015


Focus group discussions for risk assessment in Shanghai, Jan 2014


Handover the flood resilient plant to Mayor in Nonthaburi, Dec 2014

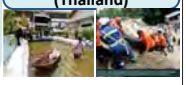
A session organised at the ISAP International Forum in Yokohama, 23-24 June 2014

Case study city analysis

Absorptive capacity
ability to minimize exposure to shocks and stresses where possible and to recover quickly when exposed (Frankenberger et al., 2012).

- **(Disaster Risk Reduction Measures)**
  - Early warning system
  - Information and education campaign
  - Organisation of community-based disaster response (volunteers and training)
  - Procurement of emergency equipment

Cebu (Philippines) Nonthaburi (Thailand)



Adaptive capacity
making proactive and informed choices about alternative strategies based on changing conditions (Frankenberger et al., 2012).

- **(Climate Change Adaptation)**
  - Plan and preserve eco-systems
  - Building regulations, housing codes
  - Planning green infrastructure
  - Improve human capital and diverse livelihood options
  - Social protection system

Ho Chi Minh (Vietnam) Shanghai (China)

Transformative capacity
system-level changes that enable more lasting resilience and often challenge the status quo in a substantial way (Béné et al., 2012).

- **(Governance)**
  - Institutional capacity
  - Strengthen governance mechanisms (partnership and transparent)
  - Regulatory and financial allocation

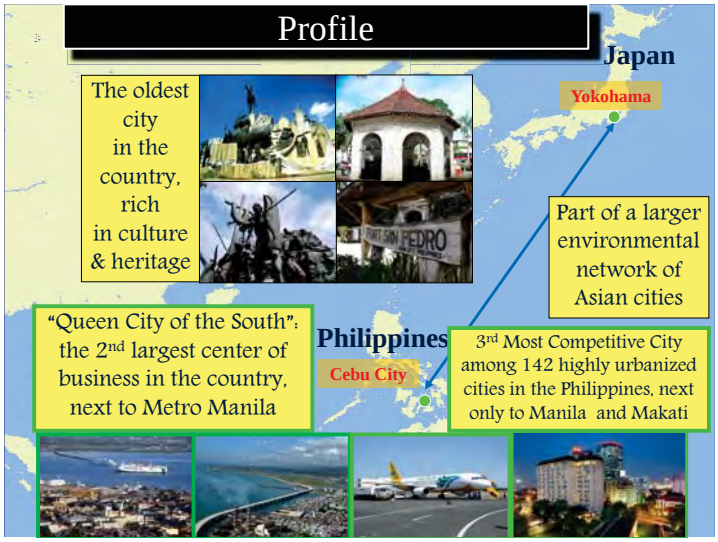
All case study cities

Thank you

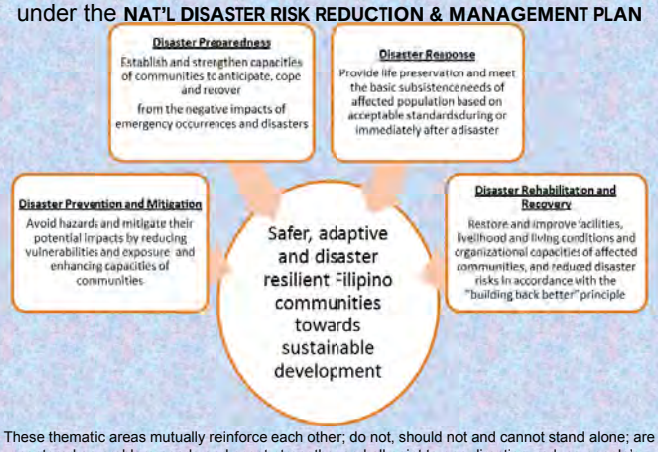
PLANNING A DISASTER-RESILIENT CITY in Cebu, Philippines

Nida C. Cabrera
City Councilor
Chairperson: Committee on Environment, Committee on Public Services, Committee on Cooperative and Livelihood
City of Cebu, Philippines
nida_cabrera@yahoo.com

Profile



Four distinct and mutually reinforcing Thematic Areas under the **NAT'L DISASTER RISK REDUCTION & MANAGEMENT PLAN**



These thematic areas mutually reinforce each other; do not, should not and cannot stand alone; are centered on problem-needs and asset-strengths; and all point to one direction: reduce people's vulnerabilities & increase their capacities.

CITY'S ACTIONS/RESPONSES TAKEN ALONG 4 THEMATIC AREAS

Prevention & Mitigation
- Mainstreaming of DRRM & Climate Change Adaptation (CCA) into local development policies, plans, programs & budget (ex. CLUP)
- Functional multi-sectoral platforms (City DRRM Council, LDRRMO & Barangay DRRM Committees)
- Conduct of risk assessments
- Establishment of early warning systems

Preparedness
- Multi-stakeholders dialogues and inclusive planning
- Development of IEC materials
- DRRM seminars & training
- Comprehensive Risk, Evacuation & Resource Mapping
- Participatory Risk Assessments
- Development of school curricula
- Emergency drills
- Procurement of emergency equipment
- Establishment of a Communication & Command Center
- Establishment of procedures on disaster communication
- Creation of Project Reduce Danger Zone (REDZ)

Response
- Operationalization of the Communication & Command Center (C3) (with 700 volunteers)
- C3 hotline numbers in partnership with telecommunication companies
- Rapid assessment of damage &needs
- Provisioning of tents & relief goods
- Management of evacuation centers

Rehabilitation & Recovery
- Relocation assistance
- Provision of housing materials
- Financial aid
- Crisis counseling

THE CITY'S CURRENT RISKS AND VULNERABILITIES

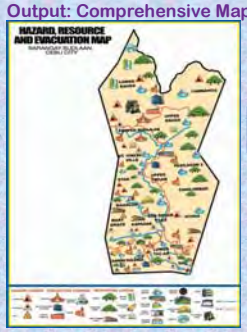
- Recurrence of the El Niño Southern Oscillation (ENSO) events
- Intensifying tropical cyclones
- Rainfall, river flow and flooding becoming more extreme
- Fire incidence
- High vulnerability to landslides from rainfall
- Major earthquakes
- Saltwater intrusion due to excessive groundwater extraction

"Hazards become disasters when vulnerable conditions exist among people, resources and other elements are exposed to risk, and capacity/measures to cope with consequences are insufficient."
National Disaster Risk Reduction and Management Plan (NDRRMP 2011-2028)

EXAMPLE OF RESULTS

Workshop with IGES

Output: Comprehensive Map



Inclusion of Risk Assessments in Major Undertakings and Scrutiny of Future Relocation Sites to be purchased by the City Government in its Housing Program

Other Barangays expressed interest to conduct comprehensive mapping

ACTIONS/RESPONSES ALSO RESULTED TO:
1. Approval of local law: *guidelines on forced evacuation*;
2. Filing of local law on creation of a multi-stakeholder disaster council;
3. Inspection of quake-vulnerable buildings in the City.

Photo credits: *The Freeman, Cebu Daily News, gmanetwork.com, AFP*

CHALLENGES AND KEY LESSONS

✓ **INTEGRATION OF THE NEEDS OF CONSTITUENT BARANGAYS.** Although Cebu City has been awarded "Best in Disaster Preparedness" by the Asian Institute of Management (AIM) Policy Center in 2010, recognized for its response and recovery efforts after the 7.2 magnitude earthquake and for its preparedness and response initiatives prior to and after the landfall of Super Typhoon Haiyan, there is still a lot of work to be done in harmonizing and integrating the needs of its constituent barangays ("villages") into the disaster risk reduction and management (DRRM) program of the city to achieve resiliency.

✓ **LACK OF A COMPREHENSIVE AND HOLISTIC RISK ASSESSMENT REPORT** that integrates results of all risks assessments conducted.

✓ **FORMULATION OF A LONG-TERM DRRM PLAN INTERFACED W/ THE MANDATED CITY CLIMATE CHANGE ACTION PLAN** to ensure continuity even after incumbent public officials are replaced by another set of officials.

Planning flood resilient city in Nonthaburi, Thailand

Pornsri Kictham
- Advisor to the Mayor of Nonthaburi Municipality
- Former Municipality Clerk

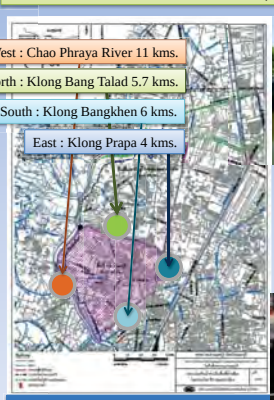
General Information about Nonthaburi Municipality

Area : 38.9 sq.km.

Population : 256,256 people

Number of Households : 129,374 households

Existing disaster risks and vulnerabilities (FLOOD)



Flood prevention system (area under pink stripe)

Flooding risks and vulnerabilities to the human lives and city's infrastructure and public services

Actions/Response Designed and Taken by City

Actions/Response Designed and Taken by Multi-stakeholders

Challenges

Government	People/Private sectors	Infrastructure
• Lack of budget for large construction project • Insufficient of materials and equipment • Coordination among government organizations ineffective • The amount of officials were not enough and exhausted • Nonthaburi municipality is prone area • Laws and regulations are ineffective	• People become alert and cooperative to the municipality when the situation went worse • They were in panic and did not understand how the municipality worked on flood prevention • Volunteers did not understand how to pack sandbags, and built an effective barrier line • No flood evacuation training	• No permanent flood protection dam along the Chao Phraya River • Watergates, drainage system and pumps were not efficient • Canals could not drain properly due to shallowness • Insufficient drainage system • Building structure intruded public area and blocked the waterway

Key lessons learned from Flood Protection Management

1. POSITIVE THINKING

PROBLEMS

OPPORTUNITIES/ CHALLENGES → VICTORY

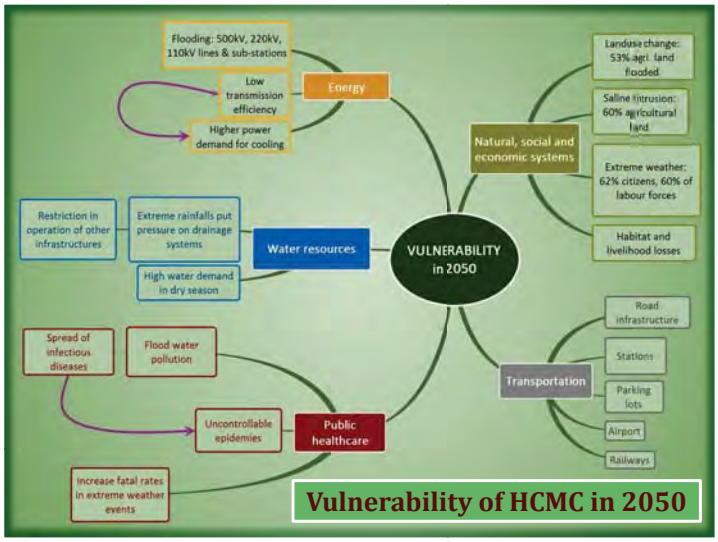
OBSTRACLES → DEFEATISM

2. FACTORS OF SUCCESS

- **T** — TECHNIC, TIME
- **E** — EVALUATION
- **A** — ADMINISTRATION
- **M** — MANPOWER
- **S** — SPIRIT, SACRIFICE

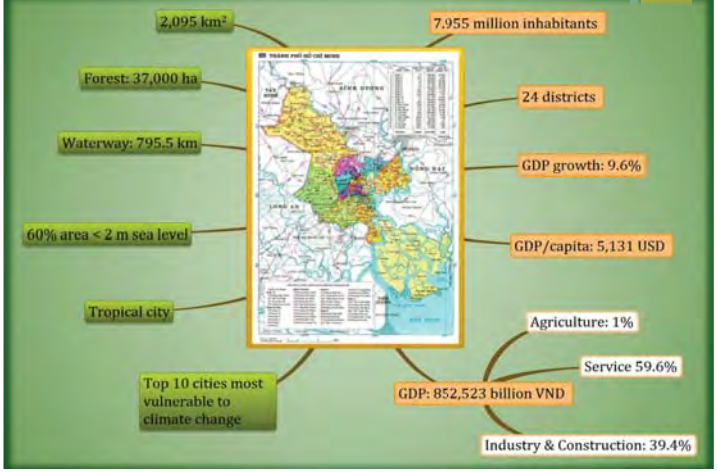
PLANNING CLIMATE AND DISASTER RESILIENT IN HO CHI MINH CITY

Yokohama, July 2015



Vulnerability of HCMC in 2050

+ City introduction



+ Actions and Results in CCAP 2013-2015

HCMC PEOPLE'S COMMITTEE

CLIMATE CHANGE STEERING BOARD (est. 2009)

HEAD OF THE STEERING BOARD
(Chairman of HCMC People's Committee)

DEPUTY HEAD
(Director of Department of Agriculture and Rural Development)

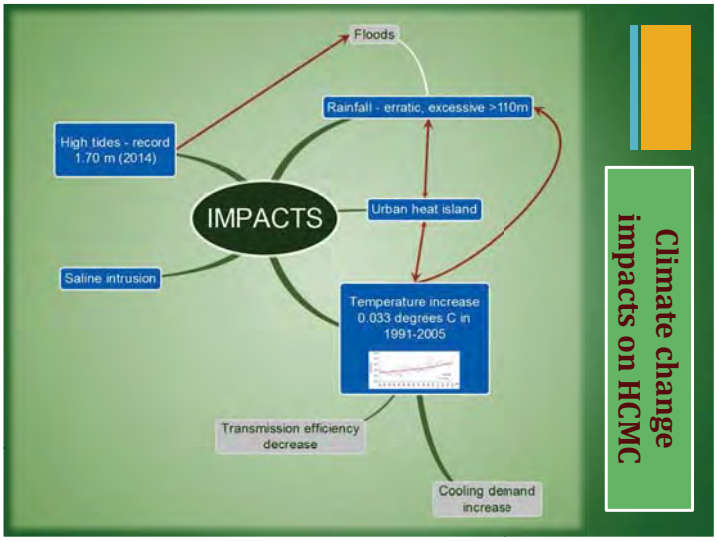
STANDING DEPUTY HEAD
(Director of Department of Natural Resources and Environment)

DEPUTY HEAD
(Vice Director of Department of Planning and Investment)

MEMBERS OF THE STEERING BOARD – Director/Vice Director of

- Department of Science and Technology
- Department of Culture, Sports
- Department of Information and Communication
- Department of Education
- Department of Planning and Architecture
- HCMC Institute for Development Studies
- Agency of Irrigation and Storm prevention
- Saigon Giai Phong News
- Steering Center for Flood Control
- Department of Finance
- Department of Construction
- Department of Health
- Department of Industry and Trade
- Department of Transportation
- Department of Tourism
- City Commander
- HCMC Police

Climate change Steering Board Organisational Structure



Climate change impacts on HCMC

+ Actions and Results in CCAP 2013-2015



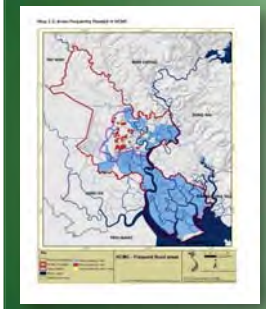

Urban Planning:
Increase urban greenery area

Energy:
- Solar power;
- Promote biogas tanks;
- Improve public lighting

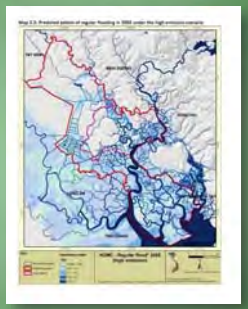
Transport:
- CNG buses;
- Metro;
- Bus Rapid Transit.

Healthcare:
Improve public healthcare system.

+ Urban flooding in HCMC



Areas frequently flooded in HCMC
(ICEM, 2009)



Predicted extent of regular flooding in 2050 under the high emission scenario
(ICEM, 2009)

+ Actions and Results in CCAP 2013-2015



Water resources:
- Cooperation with Rotterdam City;
- Reduce leakage rate;
- Enhance fresh water supply.

Waste:
- Pilot source separation;
- Promote recycling;
- Promote plastic bags reduction.

Agriculture:
- Promote hi-tech agriculture;
- Improve coastal protection forest;
- Promote 'new agriculture' model.

+ Lessons learned and cooperation needs

Lessons learned

- **Technical and management:** lack of reliable database; insufficient synchronisation and stakeholders coordination → Obstacles for comprehensive and detailed technical assessments.
- **Human resource:** Lack of high quality administrative staff and technical experts → Better stakeholders cooperation would solve personnel shortage and give more positive results.
- **Finance:** Inadequate state budget and insufficient fundraising capacity → Socialisation approach should be better adopted for efficient funding mobilisation.
- **International cooperation:** important for knowledge sharing and better funding mobilisation.

+ Lessons learned and cooperation needs

Cooperation needs

- **Database development:**
  - A synchronised and reliable database;
  - Comprehensive data updating and sharing mechanism.
- **Human resource** improvement.
- **Technical and financial** assistance for concrete projects.

+ THANK YOU FOR YOUR ATTENTION.

Study on how to build a disaster resilient city in Shanghai, China

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huqunf@tongji.edu.cn

Tongji University, Shanghai, P. R. China
Shanghai Institute of Disaster Prevention and Relief
July-29-2015

上海市——世界级现代城市
A **large** and **modern** city

Shanghai Brief Introduction

- Resident population

24.26 Million
3574person/km^2
(2014)

- Urban Area

6,787 km^2

- GDP

Total: RMB￥2.356 trillion yuan (around US$380.02 billion) (2014)
Per capita: RMB￥ 97,131 (around US$15,666)

Shanghai Brief Introduction

- Buildings (over 8 storeys with ≥20m)

36055Buildings about 34.7million m^2 (2013)

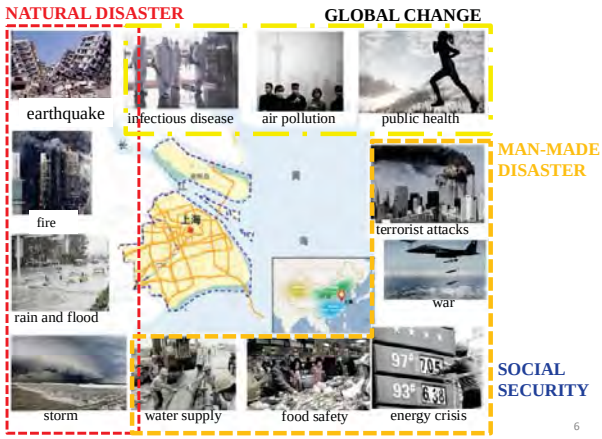
- Urban Metro Lines

Total Length of Operation Lines 567km with ridership 2.5 billion. Maximum passengers per day: 10.286million (2014)



上海市——面对灾害挑战的城市
A **challenge** city with **multi-disasters**

Risk Analysis of Disaster in Shanghai



Risk Analysis of Disaster in Shanghai


Typhoon Matsa, 2005


Metro Construction Accident, 2009


Gas Pipeline Explosion , 2010


High Building Fire , 2010

上海市——构建“弹性”的城市
How to build a **resilience** city

Some Measures to build a Resilient City

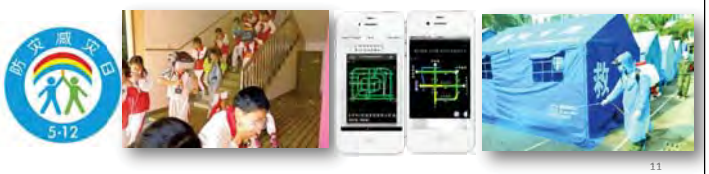
1. Put in place **organization and coordination** to understand and reduce disaster risk, based on participation of citizen groups and civil society. Build local alliances. Ensure that all departments understand their role in disaster risk reduction and preparedness.
2. **Assign a full budget** for disaster risk reduction and provide incentives for homeowners, low income families, communities, businesses and the public sector to invest in reducing the risks they face.
3. Maintain up to date data on hazards and vulnerabilities. **Prepare risk assessments** and use these as the basis for urban development plans and decisions, ensure that this information and the plans for your city's resilience are readily available to the public and fully discussed with them.

Some Measures to build a Resilient City

4. Invest in and maintain **critical infrastructure that reduces risk,** such as flood drainage, adjusted where needed to cope with climate change. Assess the safety of **all schools and health facilities** and upgrade these as necessary.
5. Apply and enforce **realistic, risk compliant building regulations and land use planning principles.** Identify safe land for low income citizens and upgrade informal settlements, wherever feasible.
6. Ensure that **education programmes and training** on disaster risk reduction are in place in schools and local communities.

Some Measures to build a Resilient City

7. **Protect ecosystems and natural buffers** to mitigate floods, storm surges and other hazards to which your city may be vulnerable. Adapt to climate change by building on good risk reduction practices.
8. Install early warning systems and emergency management capacities in your city and hold regular public preparedness drills.
9. After any disaster, ensure that the **needs of the affected population are placed at the center of reconstruction,** with support for them and their community organizations to design and help implement responses, including rebuilding homes and livelihoods.



"Coming together is a beginning.
Keeping together is progress.
Working together is success."
Henry Ford

Q&A?

THANKS

Email: huqunf@tongji.edu.cn

Tongji University, Shanghai, China

2015-7-29

上海防灾救灾研究所

Shanghai Institute of Disaster Prevention and Relief

同济大学 TONGJI UNIVERSITY

It was established in 1989 and administrated by Tongji University and Shanghai Urban Construction and Communications Commission. It is the first professional research institution to carry out urban disaster prevention and relief, and provides the disaster risk consultations and decision-making for Shanghai Government. Its 14 branches are listed as follows:

- Disaster Management and Security Policy
- Urban Disaster Simulation and Mitigation and Reduction Research
- Seismic Resistance and Disaster Prevention
- Meteorological Disaster Prevention Research
- Fire Science and Fire Protection Engineering
- Fire Science and Fire Protection Engineering
- Disaster Prevention for Lifeline Engineering System
- Underground Space Safety and Geological Disaster Reduction
- Urban Water & Flood Prevention Engineering
- Traffic Safety
- Marine Disaster
- Construction Engineering Safety
- Public Health Security
- Risk and Insurance of Engineering Disaster

Website：http://www.idpr.sh.cn

Building Resilient Cities in Asia:
A training workshop in Kobe

27-28 July 2015

Activity 1 (27 AM): Lecture on disaster risk reduction and mitigation in Kobe City


Sharing experience by Kobe City Officials


Discussion with participants


Reconstruction after 20 years


Hazardous map for each community area

Activity 2 (27 PM): Observation of the Higashinada Sewage Treatment Plant


Higashinada sewage treatment plant


Observation on the operation of the pant


Resource circulation system of sewage


Observing the final products for cement

Activity 3 (28 AM): Discussion with Maiko High School Students


Sharing experience by the students


Explaining the programme by the teacher


Observation of the solar project


Student's activities on mapping the disasters

Activity 4 (28 PM): Observation of Disaster Reduction and Human Renovation Institute (DRI)

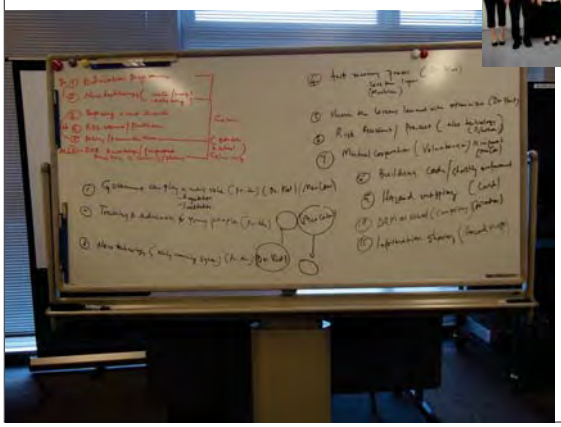

Sharing experience by DRI Officials


Observation of the collection of memories


Practical experiment of disaster resilient building


Information sharing is very important

Activity 5 (28 PM): Reflection and conclusion



この研修を実施するにあたり、多くの方にご協力を賜りました。多忙な中、視察を受け入れ準備にご尽力いただいた下記関係者の皆様に、ここに改めまして感謝の意を表します。

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神戸市建設局下水道部：高橋　俊二様、楠田　隆史様
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