12th International Symposium on Disaster Risk Management:Reconstruction Toward Resilient Cities (ISDRM 2018)5 - 8 September, 2018Lima Convention Center, Lima, Peru

MT5. Capacity building for resilience in Reconstruction

Reconstruction Towards Resilient Society: Japanese Experiences

September 6, 2018





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Professor, Ph.D., Graduate School of Engineering, Chiba University, Japan. Doctor Honoris Causa, National University of Engineering, Peru.

Contents

- Disaster risk reduction for natural hazard
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Estimated economic loss due to disasters in the world in 1975-2014.



Mechanism behind the emergence of natural disasters

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Hand Book of Total Disaster Risk Management-Good Practices, ADRC, Japan, 2005

<section-header><text><text>

Disaster Cycle and Disaster Management



Recovery, Reconstruction, and BBB

Fukkyu

復旧 = **Recovery** : Get back to the former condition

Saiken 再建 = Reconstruction : Build back

Fukko 復興 = Build Back Better *

The use of the recovery, rehabilitation and reconstruction phases after a

disaster to increase the resilience of nations and communities through integrating disaster risk reduction measures into the restoration of physical infrastructure and societal systems, and into the revitalization of livelihoods, economies and the environment.

* United Nations International Strategy for Disaster Reduction (UNISDR), Feb. 2017

Aerial video by NHK after the 1995 Kobe Earthquake





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The source region of the destructive earthquakes in Japan $(1885-2016, \text{depth} \le 100 \text{ km})$



http://www.hp1039.jishin.go.jp/eqchr/eqchrfrm.htm

The 1891 Mino-Owari Earthquake (M=8.0) 1891年濃尾地震



http://research.kahaku.go.jp/rikou/namazu/04nobi/noubi.html

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Deaths 7,273

Neodani Fault Museum for citizen's awareness raising





Reprint version published 1992

12

The 1923 Great Kanto Earthquake (M=7.9) 1923年関東大地震



Sakawagawa Br.



http://research.kahaku.go.jp/rikou/namazu/index.html





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Deaths over 105,000, mostly due to fire

Researches on the Kanto EQ are still continuing using various old documents.

地 重 第 2 年 第 53 卷 (2001) 285-302 页

1923 年関東地震の地域被害資料総覧

料

他局小堀研究F* 武村雅之·诸井孝文

Comprehensive List of the Regional Damage Data Sets for the 1923 Kanto Earthquake

Masayuki TAKEMURA and Takafumi Morot Kajima Research Complex. Kajima Corporation

The 1948 Fukui Earthquake (Mw=7.0) 1948年福井地震

Building Standard Law was issued and JMA intensity 7* was introduced after the Fukui EQ. (* equal to Modified Mercalli intensity X-XII)





Death 5,268 by GHQ



http://toshichan.be.fukui-nct.ac.jp/yoshida/works/earthquake/dplf1/NewFiles/outline1!.html

The 1964 Niigata Earthquake (Mw=7.6) 1964年新潟地震

Liquefaction countermeasures started to be introduced after the Niigata EQ.



Soil Liquefaction induced damage







Sloshing caused oil tank fire

Tsunami attacked Niigata City 15

The 1978 Miyagiken-Oki Earthquake (Mw=7.5) 1978年宮城県沖地震

Building Standard Law was upgraded after the Miyagiken-Oki EQ.



Collapse of buildings







Collapse of concrete-brick wall

Lifeline Interruption





The 1995 Kobe Earthquake (Mw=6.9)

JMA (Japan Meteorological Agency) Kobe





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January 17, 1995

The number of seismometers was not enough to estimate hard-hit areas. Telecommunication systems were disrupted in the disaster.

The 1995 Kobe Earthquake (Mw=6.9) 1995年兵庫県南部地震



Promotion of seismic strengthening of structures after the Kobe EQ





Base isolation after the 1994 Northridge EQ at LA City Hall, USA





Memorial sites and museums of the 1995 Kobe EQ

Nojima Fault Preservation Museum in Awaji Island

Kobe Port Memorial site













1.17 Theater



Time: 7 min. Powerful images and sound the dreadful devastati





Great Earthquake Hall "Living With This City"





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Seismic monitoring in Japan after the 1995 Kobe EQ

At the time of the Kobe EQ, JMA seismic stations were only about 100.



http://www.seisvol.kishou.go.jp/eq/intens_st/index.html



http://www.kyoshin.bosai.go.jp/kyoshin/topics/html20160416012405/main_20160416012405.html



Seismic monitoring for city-gas network control

Tokyo Gas Co. with 10 million customers 4,000 seismometers in Tokyo Metropolitan area







Near Real-time SHAKE Map by SUPREME 2011Tohoku EQ



Deployment of GNSS/ GPS network (GEONET) with 1,300 stations covering entire Japan



Real-time fault estimation by RAPiD (Ohta et al. (2012), after S. Koshimura) Ing. lat. dep. len. wid. str. dip. rak. slp. opn. (.t. 0s/



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3-D Full-Scale Earthquake Testing Facility: *E-Defense*

In operation since 2005 in Miki city, Hyogo Prefecture









http://www.bosai.go.jp/hyogo/ehyogo/index.html

E-Defense Full-Scale Test Videos

Full-Scale 6-story RC Building



Traditional Wooden Houses



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Following Old Japanese Seismic Code Left: *Retrofitted* Right: *Non retrofitted* JMA Kobe 100% 1995 JR Takatori 100% *Videos and tests data are available internationally.* http://www.bosai.go.jp/hyogo/ehyogo/index.html

Long-period seismic ground motion 長周期地震動 2011 Tohoku EQ in Shinjyuku, Tokyo 400 km away from the epicenter



新宿センタービル(54F)から見た 新宿野村ビル(50F,左)と損保ジャパン本社ビル(43F,右)

September 26, 2003 Tokachi-Oki EQ, M 8.0



Due to oil sloshing caused by the long-period motion, fires broke out in a tank yard.

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Testing and monitoring of buildings by SATREPS













Bruno Adriano@CISMID, Cesar Jimenez@DHN

Tsunami evacuation drill in La Punta, Callo, Peru



Awareness Raising and Dissemination Activities

Support to establish CISMID Awareness Center in Lima (CESATT)

Donation of Equipment by STREPS project

Elementary Public Awareness Models (2 sets)
 Plate techtonics model
 Tsunami generation model
 Small shaking table





- 2. Portable 1D Shaking Table (2 sets)
- 3. Hand-move Shaking Test Kit (1 set)

Continuous support by JICA and Peruvian Gov.







Human Resources Development in SATREPS project

MEXT scholarship students to Japan (Ph.D: 7, Master: 1), Trainee: 5



Training Courses in Peru





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Field activities in Peru



seismic motion



tsunami





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Sendai Framework for Disaster Risk Reduction 2015-2030

Goal It is noticed administrational measures that prevent and reduce existing disaster risk through the implementation of integrated and inclusive economic, structural, legal, social, health, ligal, li	si persons, susinesses, commu	intes and countries						Global Targets
revent new and reduce existing disaster risk through the implementation of integrated and inclusive economic, structural, legal, social, health, ultural, educational, environmental, technological, political and institutional measures that prevent and reduce hazard exposure and vulnerability of disaster, increase preparedness for response and recovery, and thus strengthen resilience Priorities for Action Focused action within and across sectors by States at local, national, regional and global levels Priority Action 1 Understanding disaster risk Priority Action 1 Understanding disaster risk Civil society, volunters, organized voluntary work organizations and community-based organizations to participate (in particular, women, children and youth, persons with disabilities, and older persons) Means of implementation Means of implementation Support from international organization Support from international organization The targets include important policy focuses, such as mainstreaming DRR, prior investment, "Build Back Better", multi-stakeholders' involvem people-centered approach, and women's leadership			Goal					① The number of deaths
Priorities for Action Focused action within and across sectors by States at local, national, regional and global levels Priority Action 1 Understanding disaster risk Priority Action 2 Strengthening disaster risk reduction for resilience Priority Action 3 Investing in disaster risk Enhancing disaster risk reduction for resilience Civil society, volunteers, organized voluntary work organizations to participate (in particular, wore, children and research entities and networks to collaborate Business, professional associations and research entities and networks to collaborate Civil society, volunteers, organized voluntary work organizations of participate (in particular, wore, children and research entities and networks to collaborate Media to take a role in contributing to the public awareness raising Civil society, volunteers, organized voluntary work organizations, children and research entities and networks to collaborate Business, professional associations and research entities and networks to collaborate Civil society, volunteers, organized voluntary work organizations, children and research entities and networks to collaborate Media to take a role in contributing to the public awareness raising General considerations Means of implementation Support from international organization Follow-up actions gtsts Seven concrete global targets were specified The targets include important policy focuses, such a	revent new and reduce existing disast ultural, educational, environmental, to o disaster, increase preparedness for r	er risk through the implementation of echnological, political and institutional esponse and recovery, and thus streng	integrated measures then resili	d and inclusive that prevent a ience	economic, structural, legal, nd reduce hazard exposure	social, health and vulnerat	ı, bility	The number of affected people Teconomic loss Conomic loss Damage to medical and educational faciliti National and local strategies Support to developing countries
Focused action within and across sectors by States at local, national, regional and global levels Priority Action 1 Priority Action 2 Priority Action 3 Priority Action 4 Enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction Understanding disaster risk Strengthening disaster risk reduction for resilience Investing in disaster risk reduction for resilience Enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction Civil society, volunters, organized voluntary work organizations and community-based organizations to participate (in particular, women, children and youth, persons with disabilities, and older persons) Academia, scientific and networks to collaborate Business, professional associations and collaborate Media to take a role in contributing to the public awareness raising General considerations Means of implementation Support from international organization Follow-up actions Seven concrete global targets were specified The targets include important policy focuses, such as mainstreaming DRR, prior investment, "Build Back Better", multi-stakeholders' involvem people-centered approach, and women's leadership		Prio	rities fo	or Action				Access to early warning information
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Sendai Framework for Disaster Risk Reduction (DRR) 2015-2030

Priorities for Action

- 1. Understanding disaster risk (DR)
- 2. Strengthening DR governance to manage disaster risk
- 3. Investing in DRR for resilience
- 4. a) Enhancing disaster preparedness for effective response, and
 b) to "Build Back Better" in recovery, rehabilitation and reconstruction (RRR).

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Tasks recommended for Priority 4b (BBB) and Capacity Building (CB)

Develop an all-stakeholder, national-level disaster recovery framework
 → CB of policy makers and national/local governments with
 international cooperation (UN, JICA, NGOs)



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- Enable pre-disaster recovery planning (PDRP) among all stakeholders
 → CB and to study good practices by local government and community
 with the support of urban planners, NPOs and private sectors
- 3. Formalize processes and systems to enable effective **assessment of post-disaster damages and needs**

 \rightarrow CB of local governments and practitioners with the support of research institutes and NGOs.

Institute or strengthen policies, laws, and programs that promote, guide, and support BBB in RRR in both the public and private sectors, and by individuals and households → CB of public/private sectors and community leaders by national gov.

https://www.unisdr.org/files/53213_bbb.pdf

Good Practice of Build Back Better from the 1995 Kobe earthquake (1): Rokkomichi-South district, Kobe City



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http://www.bousai.go.jp/kyoiku/fukko/shisai/pdf/rokkomichi.pdf

Process of Better Reconstruction through communication with the residents

Rokkomichi-South district, Kobe City

Time Line

	Thic Elic			
	Feb. 1, 1995	Article 84 of Building Standards Law, construction restricted areas		
1 st Step of Planning	March 17, 1005	announced.		
Area determination	March 17, 1995	Orban Planning of Orban Area Redevelopment Project Type 2 decided.		
Building restriction Framework of roads, etc.	April - June 1995	Councils of Town Development by 4 districts established.		
	July 9, 1995	"Council of Rokkomichi Station South Town Development Union"		
2 nd Step of Planning	-	established.		
Reflecting residents' opinions	March 17, 1996	Park and Road Layout Plan determined.		
Change on framework of park, etc.	Dec. 16, 1996	Town development proposal submitted by Council of Union.		
 Decision on town planning policy 	Feb. 28, 1997	Change in Urban Planning of Urban Area Redevelopment Project Type 2		
	July 9, 2005	Redevelopment Project completed.		
1005 1				











Communication with residents

http://www.urca.or.jp/chousa/mk arc/07jireiken/02-2uerubu.pdf 45

Damage situations after the 2007 Pisco EQ.

Non-engineered buildings suffered severely.





http://www.bousai.metro.tokyo.jp/foreign/english/index.html

What shall we do in developing countries?

Improvement of construction practice and enforcement of laws & regulations



Interview on public awareness



G0 (confined masonry)



EMS 1998

Damage class

Conclusions

- Trend of natural disasters and process of risk reduction were discussed towards resilient society.
- Earthquake history in Japan and lessons learned were presented.
- Research programs in Japan after the 1995 Kobe earthquake were highlighted.
- Summary of SATREPS Peru project was presented.
- Concept of Build Back Better was introduced and examples of good practice were presented.



G4 (adobe)

G5 (adobe)

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G3 (brick masonry)

Pre-Disaster Recovery Plan of Tokyo Metropolitan Government (TMG)

Recovery Manual

Recovery Ground Design

Recovery Simulation Drill Inspection, consultation, mapping, and implementation to development plan

Ground Design



