

CIGS Special Seminar
Catastrophic Disasters:
Confronting Novel Preparedness Challenges

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Michio Suzuki, Secretary-General, CIGS

2. Introduction: Revisiting the Tohoku Crises

Jun Kurihara, Research Director, CIGS

3. Catastrophic Disasters: Confronting Novel Preparedness Challenges

Arnold M. Howitt

4. Q&A

Moderator: Jun Kurihara

Today’s Topics

Emergency preparedness in most countries concentrates on risks that can be anticipated because of direct experience, events elsewhere, formal risk analyses, or scenario development.

But how can society more effectively prepare for novel threats or events that either have not been seen before (e.g., emergent infectious disease, undiscovered seismic faults), or arise at a scale that far exceeds expectations (Hurricane Katrina, the March 11 earthquake/tsunami), or involve simultaneous disasters that together pose novel challenges (earthquake, tsunami, nuclear accident)?

Latest Book edited by Dr. Howitt

(with his colleague H. B. Leonard)

Managing Crises: Responses to Large-Scale Emergencies, CQ Press, 2009



Managing Crises: Responses to Large-Scale Emergencies, CQ Press, 2009

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Conclusion: High Performance in Emergencies: Two Modes of Operation

CIGS Special Seminar “Catastrophic Disasters: Confronting Novel Preparedness Challenges”

Asia Public Policy Forum: Disaster Management in Asia

May 13-15, 2012

Lee Kuan Yew School of Public Policy, National University of Singapore

Program

Session 1: Disaster Management and Public Policy in Asia

Session 2A: Disaster Preparedness and Capacity-Building

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Session 6A: The Risks of Infrastructure and Technology Failures

Session 6B: Disaster Resilience and Mental Health

Crisis: A Typology

A Typology of Collective Stress Situations

	Global/National	Regional	Segmental	Local
Sudden	Nuclear war Enemy Invasion Economic crash Rebellion	Earthquake Major flood Nuclear plant meltdown Hurricane	Ethnic massacre Corporate layoff Expropriation of property of a class	Tornado Explosion Ghetto riot Plant closing
Gradual	Depression Epidemic Environmental decay Government breakdown	Famine Drought Price collapse Land exhaustion	Aborigines dying off Obsolete occupation Group discrimination Addictions to harmful substances	Decline of main industry Environmental pollution Land sinking Coal seam fire
Chronic	Poverty Endemic disease Wartime bombing Colonialism	Backward regions Endemic disease Civil war	Enslavement Class discrimination Persecution Gender discrimination	Slum, ghetto High crime areas

Source: the author’s modification and rearrangement of a table in Allen H. Barton’s article, “Disaster and Collective Stress,” in *What Is A Disaster? New Answers to Old Questions*, edited by Ronald W. Perry and E.L. Quarantelli, 2005.

Multi-Agency Coordination Challenges

Types	Challenges
Organization	<ul style="list-style-type: none"> Clear and effective leadership Adequate multi-agency response procedure Clear and reasonable role and responsibility of each agency Clear coordination principle of conflicting goals
Information Management	<ul style="list-style-type: none"> Adequate Knowledge/information management Clear common operational picture
Communication	<ul style="list-style-type: none"> Clear common communication structure Communication of accurate, consistent, and complete information Communication with an appropriate interval
Situation Awareness	<ul style="list-style-type: none"> Entire membership of coordinating agency Adequate common situation awareness Adequate understanding of each agency’s role, capability, and resources
Equipment	<ul style="list-style-type: none"> Adequate and compatible communications technology Common level of sophisticated equipment
Cultural Issues	<ul style="list-style-type: none"> Compatible procedures Adequate understanding of each agency’s organizational culture
Training	<ul style="list-style-type: none"> Sufficient multi-agency training exercise Each agency’s working experience with other agencies

Source: the author’s modification and rearrangement of a table in the article of Paul Salmon *et al.*, “Coordination during Multi-agency Emergency Response: Issues and Solutions,” *Disaster Prevention and Management*, Vol. 20, No. 2 (April 2011).

Revisiting the Tohoku Crises

Material Presented at a Seminar at Harvard Kennedy School just after the “3/11”

Letters from Quake-hit Japan — Stories Unfolding amidst Tragedies —

Material prepared for
Disaster Management
in Asia Seminar Series
“Japan in Crisis:
Exploring the Consequences
of a Cascading Disaster”

March 22, 2011
Harvard Kennedy School



Minami-sanriku, Miyagi Prefecture (Source: Kyodo News, via AP)

Jun KURIHARA

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Note: The crisis in Japan is still ongoing. Therefore, it should be noted some of data in this presentation are tentative and subject to revision afterwards.

Letters from Quake-hit Japan

— *Stories Unfolding amidst Tragedies* —

A Tentative Assessment of the Tohoku-Pacific Ocean Earthquake

1. Disaster Diagnoses (Tentative)

Series of huge earthquakes, tsunamis, and resultant blackouts . . .

2. Disaster Responses amidst Cascading Disasters

Disaster responses during the first TWO hours after the earthquake

3. Nuclear Power Plant (NPP) Disaster Management

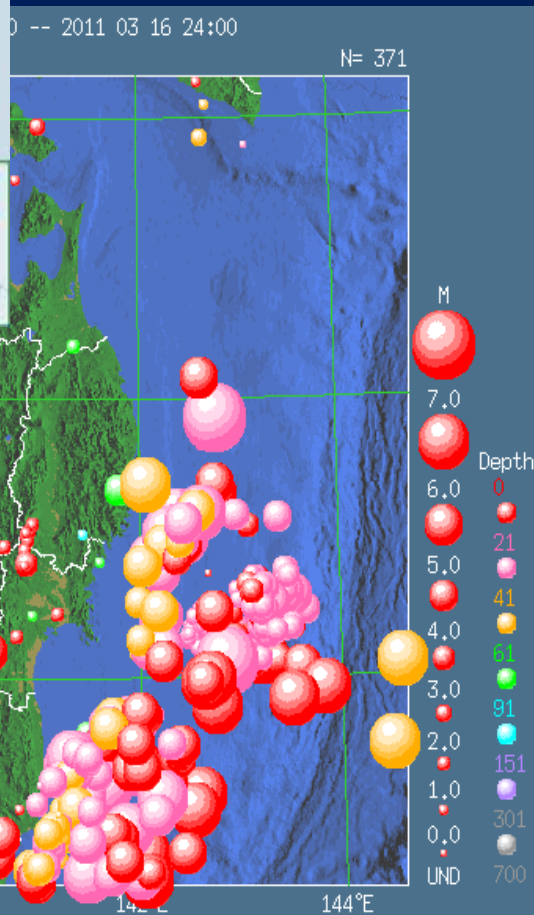
Organizational structure of Japan and the case of Fukushima I NPP

4. Evaluations (Tentative)

Preparedness, responses, recovery, communications and globalization

1.1. Trembling Earth

Quakes between
Mar. 10 and 16
Number of Quakes:
 $M \geq 7$: 4; $7 > M \geq 6$: 43



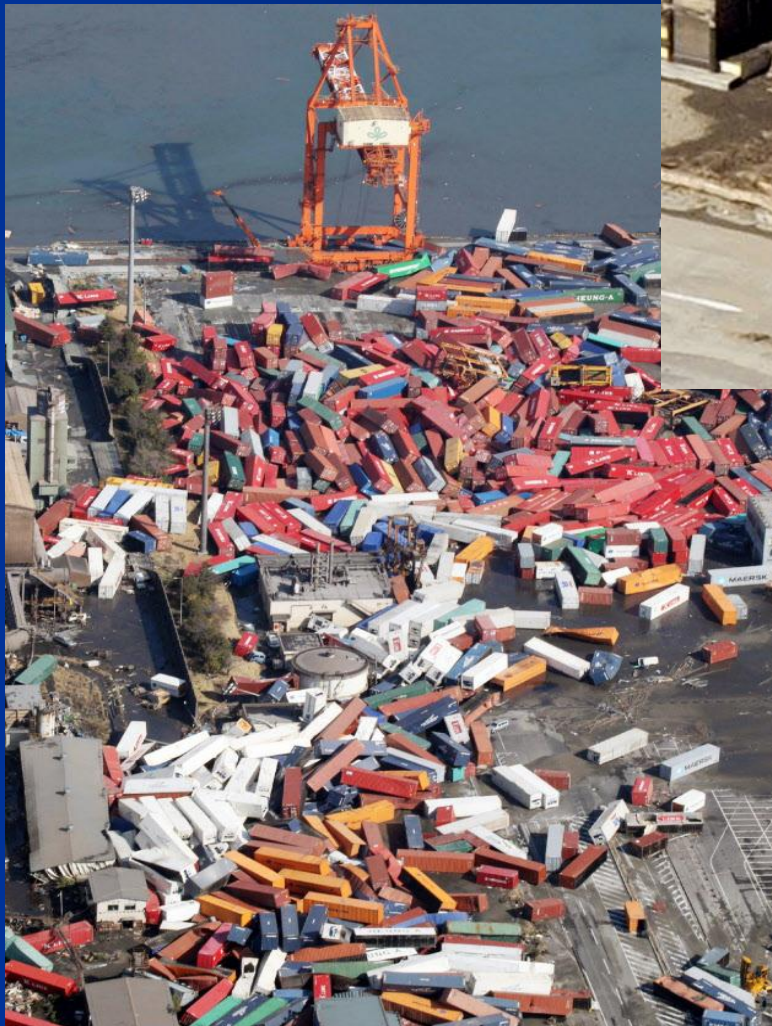
Mar. 10	6:24	off Sanriku Coast	6.6
Mar. 11	14:46	off Sanriku Coast	9.0
	15:06	off Sanriku Coast	7.0
	15:15	off Ibaragi Coast	7.4
	15:26	off Sanriku Coast	7.2
	16:15	off Fukushima Coast	6.8
	16:29	off Sanriku Coast	6.6
	17:19	off Ibaragi Coast	6.7
	17:47	off Fukushima Coast	6.0
	20:37	off Iwate Coast	6.4
Mar. 12	0:13	off Ibaragi Coast	6.6
	3:59	Niigata-Chuetsu	6.6
	4:03	off Sanriku Coast	6.2
	4:47	off Akita Coast	6.4
	5:11	off Sanriku Coast	6.1
	10:46	off Fukushima Coast	6.4
	22:15	off Fukushima Coast	6.0
	23:43	off Iwate Coast	6.1
Mar. 13	7:13	off Fukushima Coast	6.0
	8:25	off Miyagi Coast	6.2
	8:25	off Miyagi Coast	6.2
	10:26	off Ibaragi Coast	6.4
	20:37	off Fukushima Coast	6.0
Mar. 14	14:02	off Ibaragi Coast	6.2
	15:13	off Fukushima Coast	6.3
Mar. 15	18:50	off Fukushima Coast	6.3
	22:31	Eastern Shizuoka	6.0
Mar. 16	0:24	off Sanriku Coast	6.0
	12:52	off East Cost of Chiba	6.0

Source: *The Economist*,
 March 11, 2011

Source: Japan Meteorological Agency (JMA)

1.2. Lethal Danger Is NOT Quakes BUT Tsunamis

All Nuclear Power Plants
Withstood Quakes,
but



Sendai City, Miyagi Prefecture (Source: *Nihon Keizai Shimbun*)



JASDF Matsushima Air Base, Miyagi Prefecture (Source: Kyodo)



Kesennuma, Miyagi Prefecture (Source: Kyodo)

1.3. Blackouts, and Lack of Fuels, Water, and

No. of Houses Suffering Blackouts, Unit: Million

	Time	Tokyo Electric	Tohoku Electric	Notes
Mar. 11	15:30	4.05	4.40	
	20:00	3.94	4.38	
	22:00	3.44	4.40	
Mar. 12	0:00	2.58		
	4:00	1.62		Tokyo: 0
	5:00	1.44	4.40	Kanagawa and Shizuoka: 0
	6:00	1.24	4.40	Saitama and Yamanashi: 0
	7:00	1.77	4.40	Gunma: 0
	10:00	1.00	4.11	
	21:00	0.45	2.30	
Mar. 13	15:00	0.26	1.58	
Mar. 14	16:00	0.07	0.97	Chiba and Tochigi: 0
Mar. 15	14:00	0.05	0.76	(Ibaragi: 5,100)
Mar. 16	22:00	0.03	0.48	(Ibaragi: 2,561)
Mar. 17	19:00		0.36	

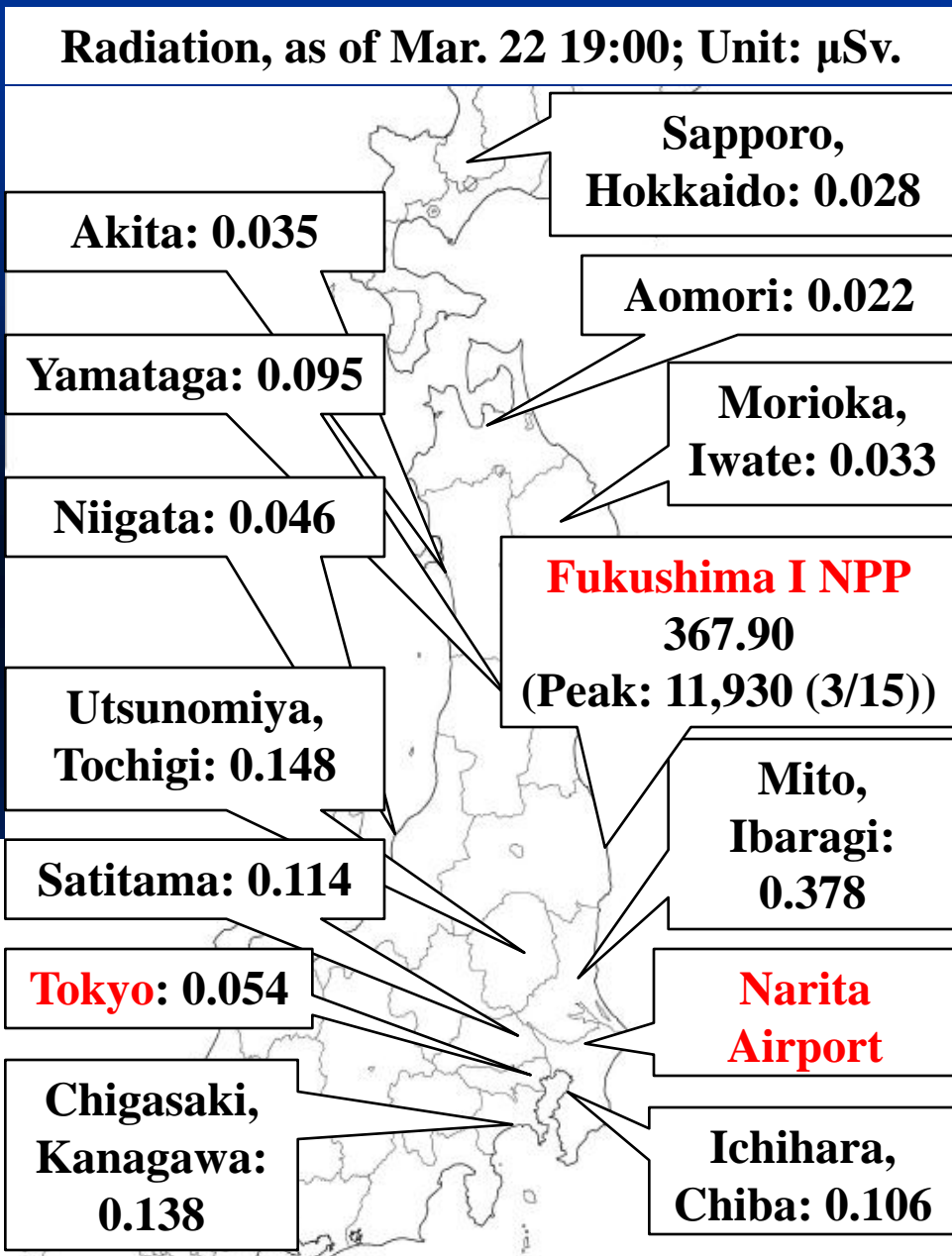
Note: The size of the largest blackout in the Tokyo metropolitan area in recent years is the case of August 14, 2006, when 1.26 million houses suffered the blackout.

Source: Tokyo Electric Power Company (TEPCO) and Tohoku Electric Power Company

1.4. Unfolding Tragedies and Spreading Fears of Nuclear Disasters

Rising Death Toll

	Death	Missing	Injured	Isolated in inaccessible areas	Evacuees
3/14	4,227	8,194	2,282	16,150	429,180
3/17	5,692	9,508	2,409	16,160	389,870
3/19	7,348	10,847	2,603	22	366,858
3/20	8,133	12,272	2,612	4,140	362,887
3/21	8,649	13,261	2,644	-	337,300
3/22	9,080	13,565	2,675	-	268,510



Radiation Level, Unit: μSv .

- Chest X-Ray Test: 50
- Tokyo-New York round trip: 200
- Abdominal X-Ray Test: 600
- Chest CT Scan: 6,900
- Maximum Acceptable Level per year: 80,000
- Higher Risk of Cancer: 100,000

2.1. Emergency Responses: (1) Timeline: First 50 Minutes Slide No. 15

14:46 Quake off Sanriku Coast M9.0

14:46 **Nuclear and Industrial Safety Agency (NISA)**, the Japanese counterpart of the U.S. Nuclear Regulatory Commission (NRC), establishes an emergency headquarters

14:49 **Fire and Disaster Mgmt Agency (FDMA)**, through J-Alert, a satellite warning system, warns 37 local governments against huge tsunamis

14:50 **Prime Minister's Official Residence** sets up an emergency team, aiming at (1) damage assessment, (2) ensuring the safety of people, (3) recovery of infrastructure, and (4) providing of accurate information

15:06 Quake off Sanriku Coast M7.0

15:14 **Central Disaster Mgmt Council** is established

15:15 Quake off Sanriku Coast M7.4

15:15 Tsunami 3.2m Ofunato, Iwate

15:21 Tsunami 4.1m Kamaishi, Iwate

15:21 Tsunami 4.0m Miyako, Iwate

15:21 **Bank of Japan (BOJ)** sets up a disaster mgmt team

15:26 Quake off Sanriku Coast M7.2

15:27 Prime Minister orders the **Japan Self-Defense Forces (JSDF)** to make a maximum effort for disaster response

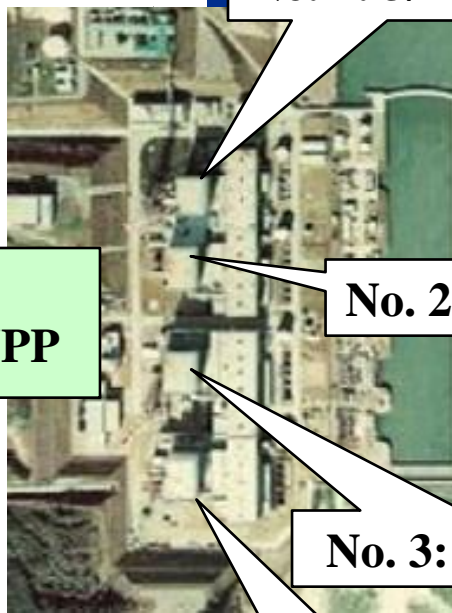
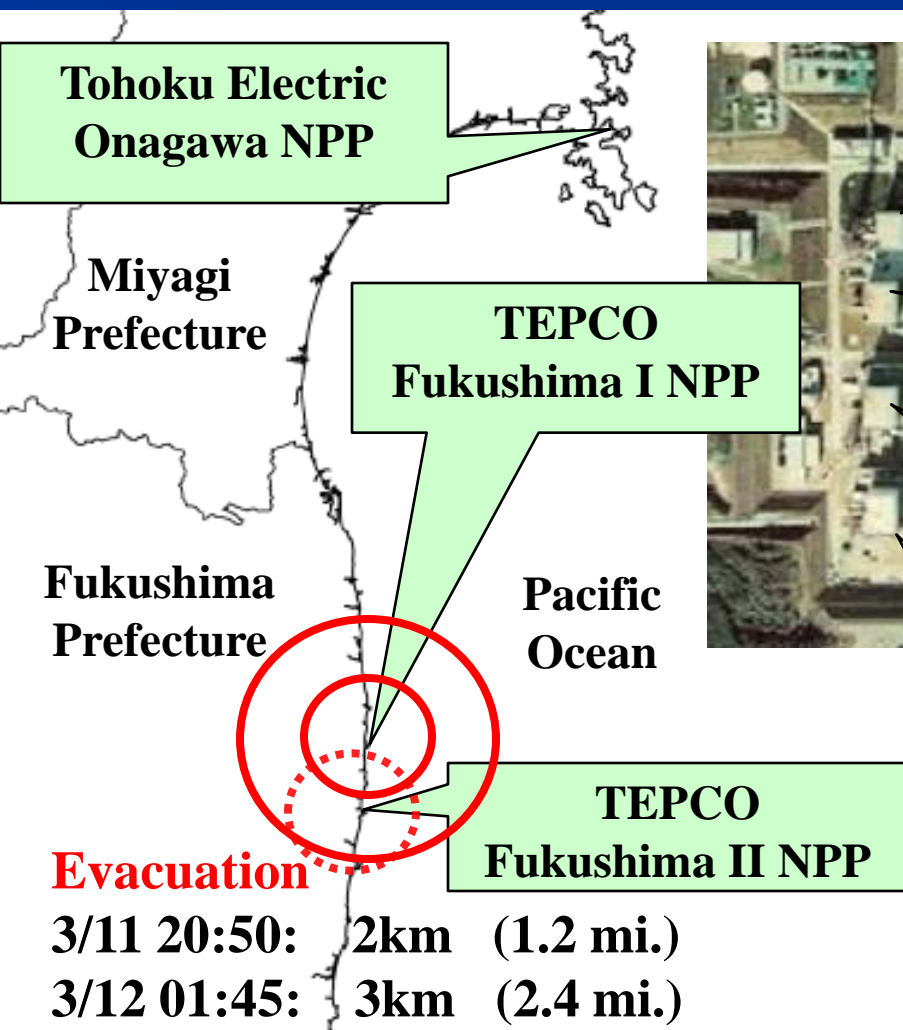
15:30 **Tokyo Electric Power Company (TEPCO)** makes its first announcement: All reactors of nuclear power plants (NPPs), found automatically shut down; it also reports blackout of 4.05 million houses

2.2. Emergency Responses: (2) Timeline: Next 70 Minutes Slide No. 16

- 15:37 Gov't convenes the 1st Central Disaster Mgmt Council
- 15:42 TEPCO reports to NISA about malfunctioning of **Fukushima I NPP's** Reactor Nos. 1, 2, and 3
- 15:50 Tsunami 7.3m at Soma, Miyagi
- 15:57 Quake off Ibaragi Coast M6.1
- 16:00 Gov't convenes the 2nd Central Disaster Mgmt Council
- 16:00 NISA initiates an emergency headquarters to collect information on 55 nuclear reactors in Japan
- 16:15 Quake off Fukushima M6.7
- 16:29 Quake off Sanriku M6.6
- 16:30 TEPCO makes its second announcement: All NPPs are under control but **7 thermal power plants** have been closed
- 16:36 TEPCO reports NISA about malfunctioning of the emergency cooling systems of **Fukushima I NPP's** Reactor Nos. 1 and 2
- 16:36 Prime Minister's Official Residence sets up an emergency headquarters
- 16:45 TEPCO reports to NISA about malfunctioning of **Fukushima I NPP's** Reactor No. 2

3.1. Nuclear Emergency Responses at Fukushima I NPP

amidst Continuing Quakes and Tsunamis



No. 1: 3/11 15:42

No. 2: 3/11 15:42

No. 3: 3/11 15:42

No. 4: 3/15 09:38

19:03: Nuclear Emergency

Hydrogen Explosions

3/12 15:36: No. 1
3/14 11:01: No. 3

Explosion and Fire

3/15 06:10: No. 2
3/15 09:38: No. 4

Cooling reactors with seawater and boron

3/12 20:20: No. 1
3/13 13:12: No. 3
3/14 16:34: No. 2

Evacuation

3/11 20:50: 2km (1.2 mi.)
3/12 01:45: 3km (2.4 mi.)
3/12 05:44: 10km (6.2 mi.)
3/12 18:25: 20km (12.4 mi.)

3/12 07:45: Nuclear Emergency

Evacuation (Fukushima II NPP)

3/12 07:45: 3km; 17:39: 10km

Situation at Fukushima I Nuclear Power Plant (NPP)

Time to Examine the “Myth” about Nuclear Power Safety

1. Disaster Preparedness

Difficulty of predicting tsunami impacts on NPPs

Cooling system: Brittleness of the triple safety system—Power lines and generators

2. Disaster Responses

Recovery operations amidst earthquakes and tsunami warnings

Inevitable human errors

Disruption of communications and evacuation

Difficulty of handling simultaneously occurring crises (Fukushima I and II)

3. Disaster Recovery

Long way to restore “trust” and to scrap “safely” Fukushima I

Difficulty of restoring activities in radiation contaminated areas

4. Evaluations (Tentative)

Disaster preparedness: Structural strength of NPPs, Redesigning contingency plans

Importance of communications: Intra- and inter-organizational, and public

1. Disaster Preparedness: Effectiveness and Efficiency Are of Great Essence

Redesigning contingency plans regarding, e.g., rolling blackouts, metropolitan commuters, hospitals, and elderly people

2. Disaster Responses: Resources Are Limited and Speed Is of Great Essence

*Assessment and prioritization of simultaneously occurring crises
Sophistication of organizational structure for optimum division of labor*

3. Disaster Recovery: A Pile of Uncertainties

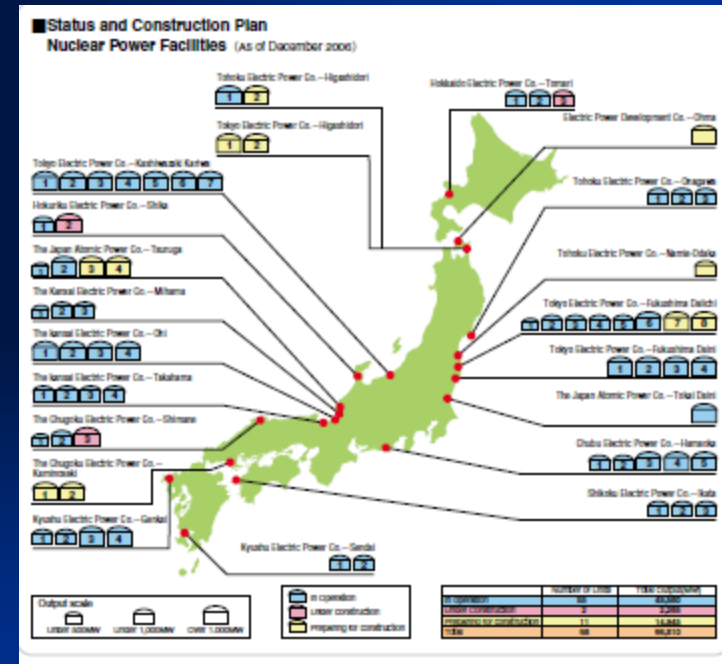
*Fiscal strength of Japan's economy
Restoration of global supply chain networks
Legal consideration of the reconstruction of tsunami-hit areas
Resuscitation of quake-hit communities and social capital*

4. Evaluations: Time to Think Seriously

*Disaster preparedness:
Structural strength of NPPs
Implications of globalization:*

Information travels fast and forcefully like tsunami

*Importance of communications (accountability & transparency):
domestic and global*



Source: Nuclear Safety Commission (NSC)

4.2. Implications of Globalization: Photos and Fears Travel Fast on the Globe



Disaster Management Center, Minami Sanriku, Miyagi, (Source: Kyodo)



Fukushima I NPP (Source: *New York Times*/AFP)



Tokyo (Source: *Nihon Keizai Shimbun*)



Fukushima Prefecture (Source: *New York Times*/Asahi Shimbun/European Pressphoto Agency)