



Lessons on Long-term recovery learned from recent earthquake disasters in Japan

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Old Japanese Disaster Management Paradigm

Disaster Mitigation
by
vulnerability Reduction



Disaster Mitigation Framework

$$D = f(H, E, V)$$

↓
Disaster
Mitigation

Where D: Damage
H: Hazard
E: Exposure
V: Vulnerability

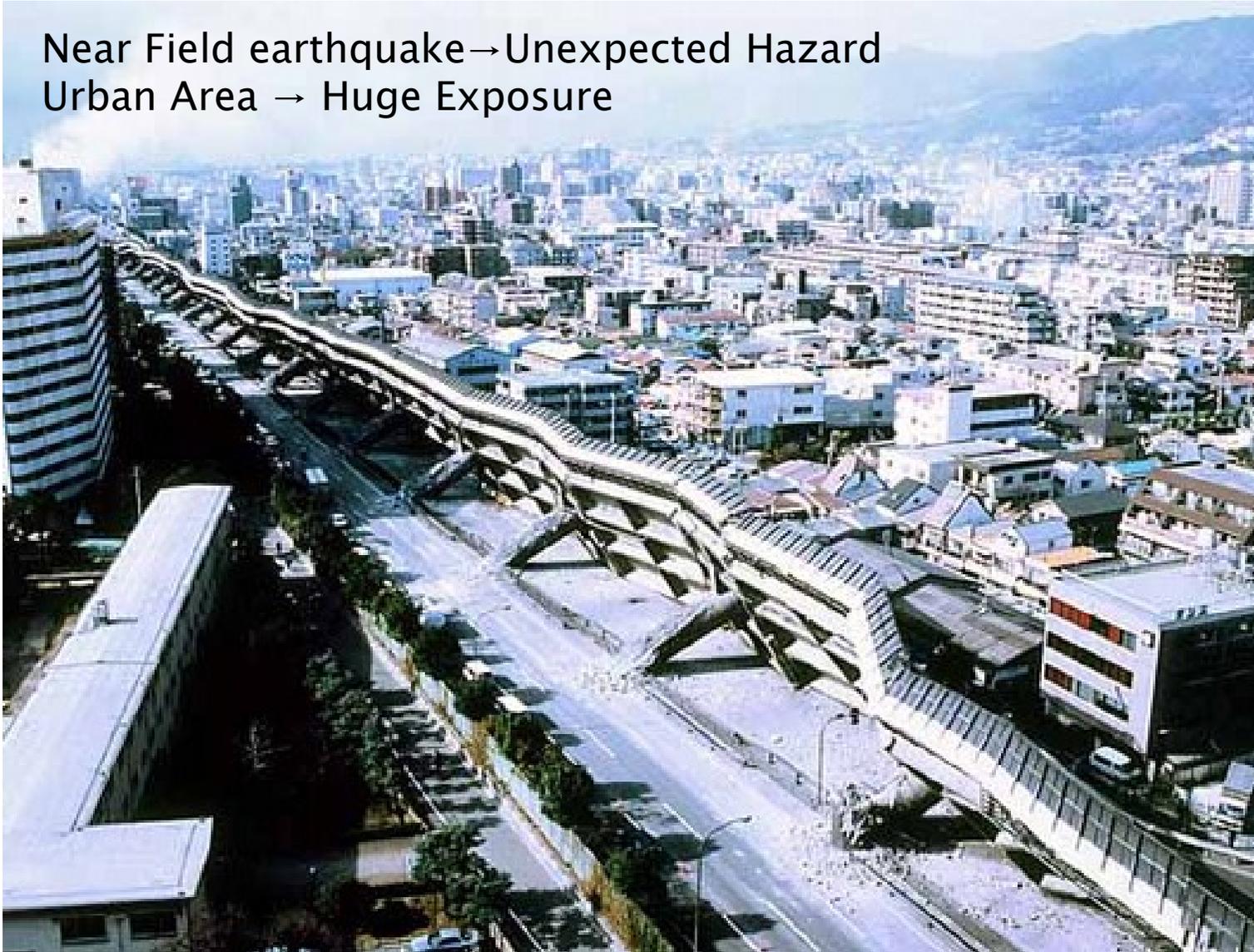


Focus on Structural Vulnerability Reduction



Unprecedented Severity of Urban Earthquake

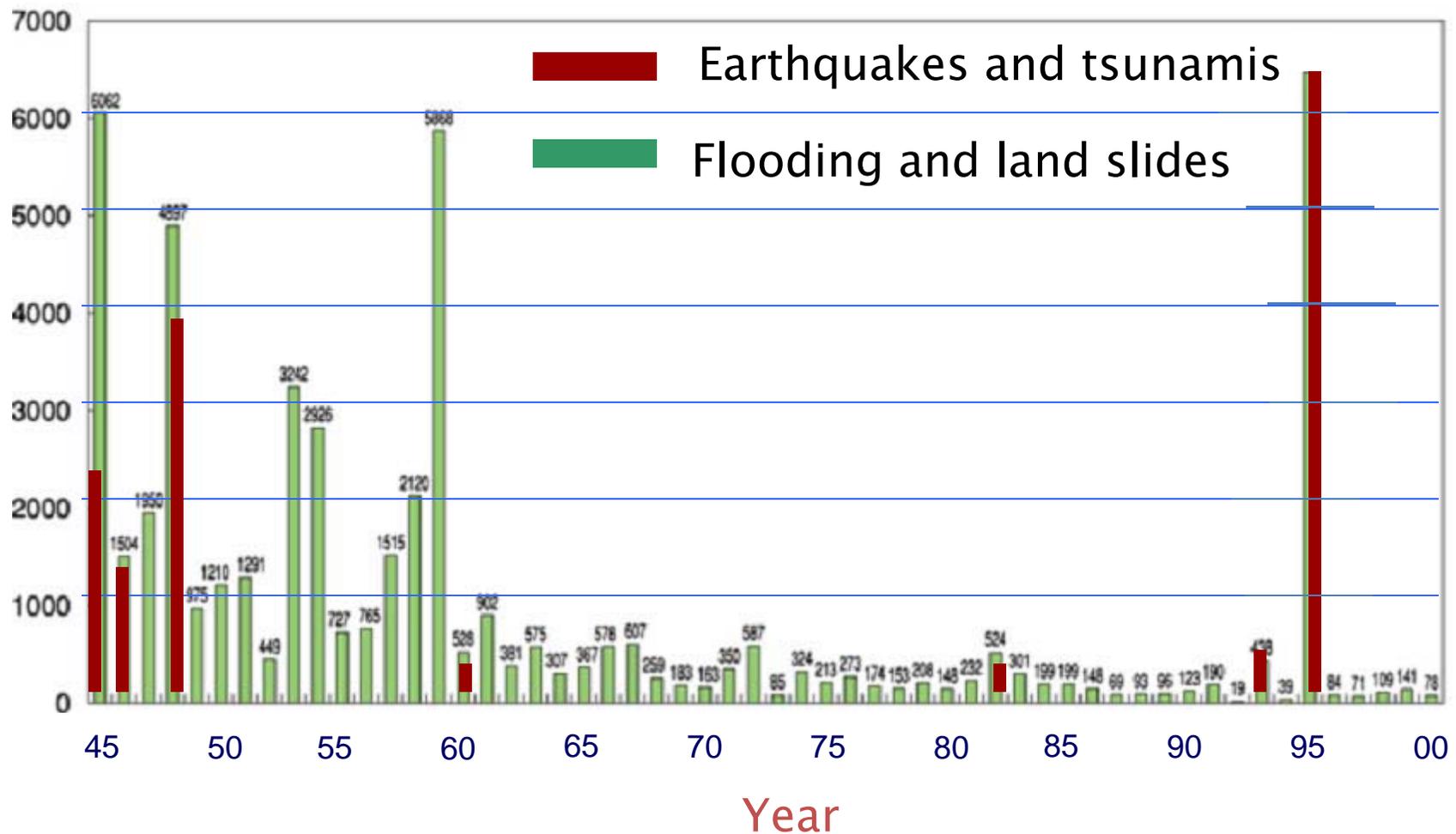
Near Field earthquake → Unexpected Hazard
Urban Area → Huge Exposure





Japanese Disaster Mortality 1945–2000

Mortality





What happened in Kobe

Large scale
Disasters



Near Field
Earthquake Disasters



$$D_e = f(H_e, E, v)$$



Unexpected Scale of Hazards

2011.3.11

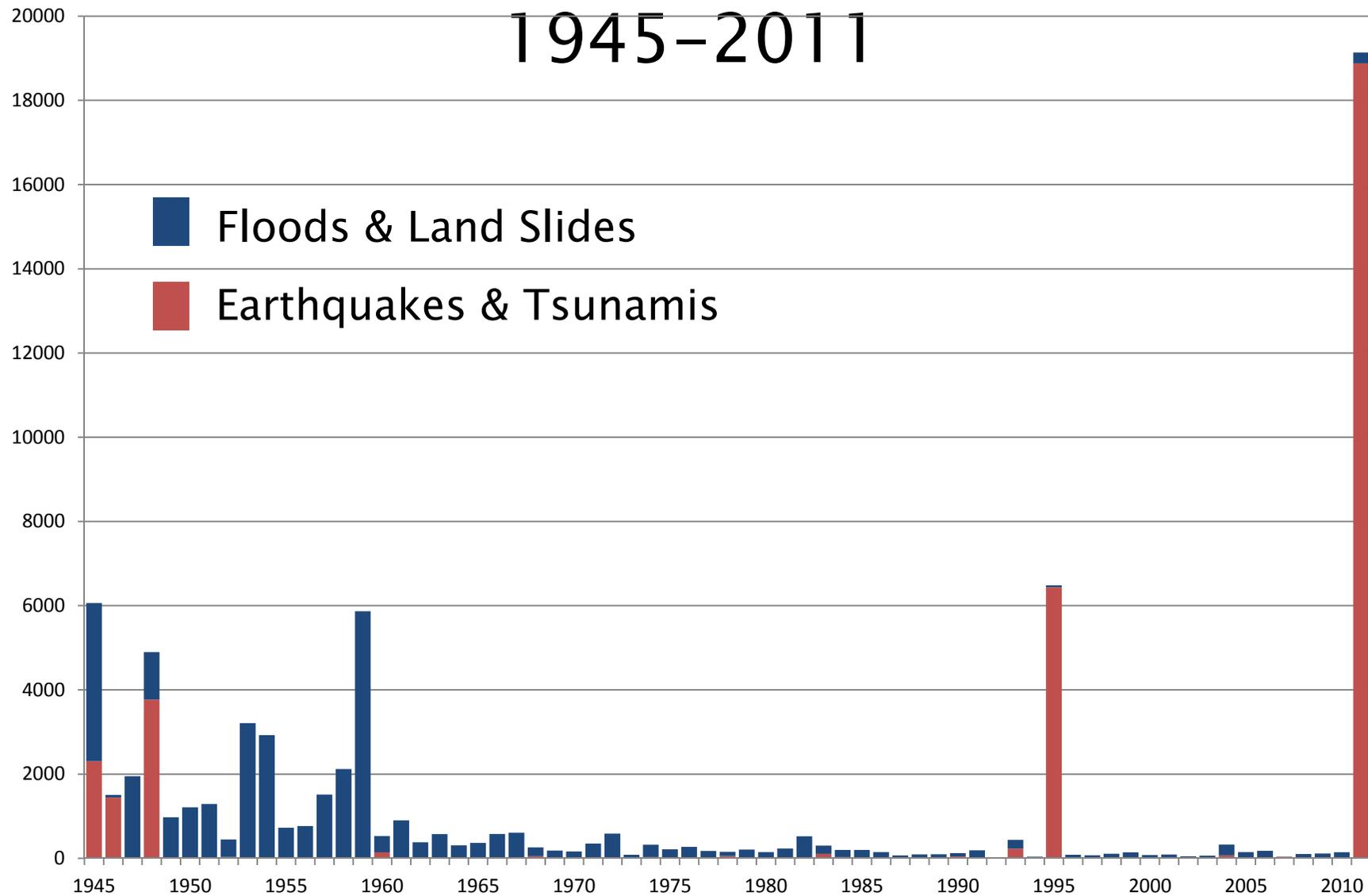
Mw=9.0 Earthquake → Rare hazard
Landscape scale Area → Huge Exposure



2011.3.11 Tohoku Earthquake and Tsunami Disaster(Mw=9.0)



Japanese Disasters by Mortalities





Unexpected Intensity of Familiar Hazards

Large scale
Disasters



Rare
Intensity of
Old Hazard



Landscape
Scale
Exposure



$$D_{et} = f(H_{et}, E, V)$$



What these examples suggest

Single hazard focused
structural mitigation model is
not good enough

Need for a New Paradigm



New Research Framework “Disaster Resilience Model”

$$R = f(D, A, T)$$

Where

R: Resilience

D: Damage = $f(H, E, V)$

A: Human Activities

T: Time



What is new in this model

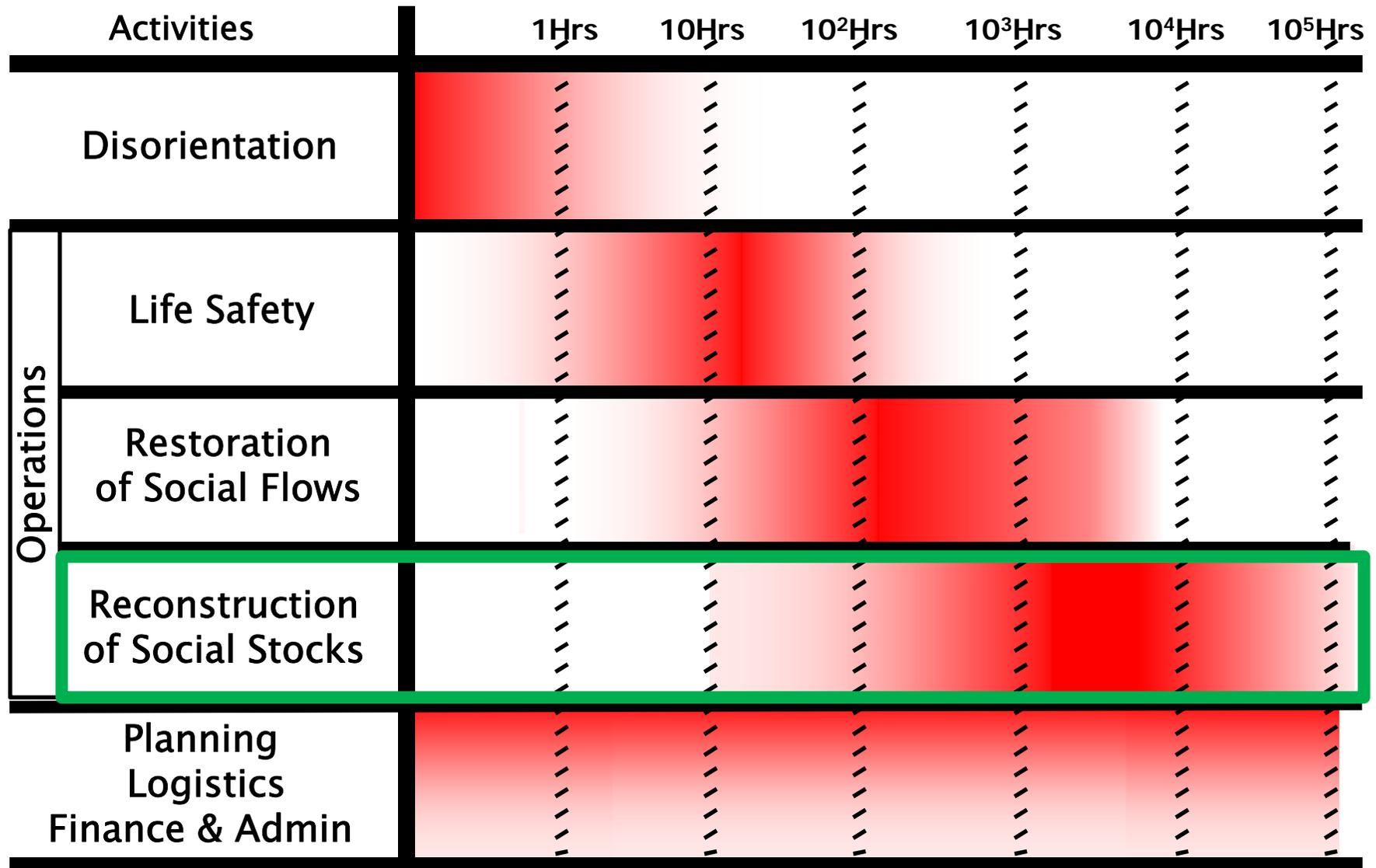
$$R = f(D, A, T)$$

$$\text{where } D = f(H, E, V)$$

$$R = f(\underbrace{H, E, V}_{\text{Prevention}}, \underbrace{A, T}_{\text{Recovery}})$$



Human Activities & Time





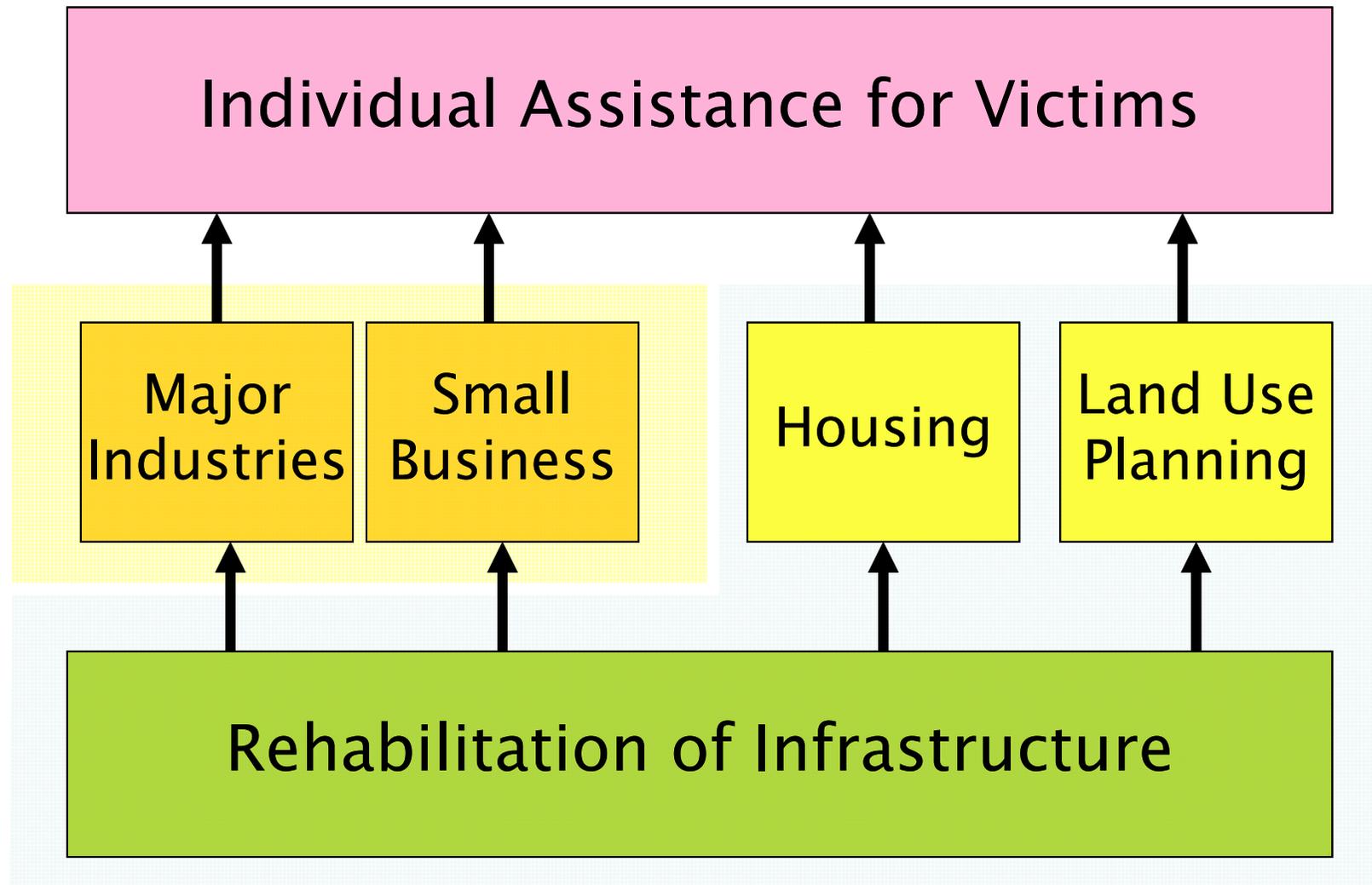
Two kinds of recovery (重建)

- *fukkyū* (復旧) :
 - “return to status quo ex ante”

- *fukkō* (復興)
 - “adapt to the status quo ex post”
 - As a result of the unprecedented 1995 Kobe earthquake devastation



Basic Structure of Kobe Recovery Program





Three Goals of Kobe Recovery Plan

Physical Recovery

Reconstructing Destroyed Cities

+

Economic Recovery

Revitalizing Local Economies

Life Recovery

Helping Disaster Victims



Physical Recovery

Reconstructing Destroyed Cities:

Success



Long-term Physical Recovery

From July, 1995 to March, 2000



Residential Area

Higashinada Ward, Kobe City



Commercial/Residential
Mixed Area

Nagata Ward. Kobe City



What was done

- **Wise Land Use Planning**
 - Planning First
 - Moratorium for the First Two months to prohibit building construction
- **Quick Debris Removal: 1 year**
 - Recycle debris by discriminating materials
- **Quick Restoration of Infrastructure:**
 - In 2 years
 - Basis of all kinds of recovery activities
- **Providing Places to Live for Victims:**
 - In 3 years, the number of newly constructed houses exceeded that of destroyed by the disaster
 - In 5 years, no temporary housings left
 - ‘building codes’ were enforced strictly for a higher seismic performance



Why we succeeded

- **Based on Lessons Learned from Many Past Disasters**
 - 1923 Kanto Earthquake,
 - Post WWII Reconstruction
 - Large Scale Fire Incidents
- **Specific Numerical Targets helped to facilitate the process**
 - In the First Five Years, Physical Recovery was Completed



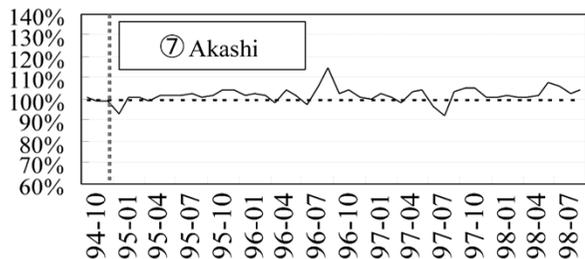
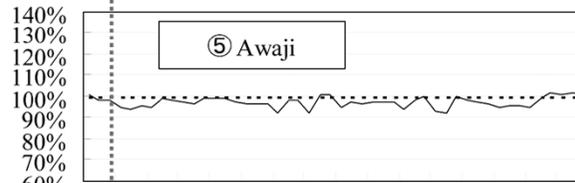
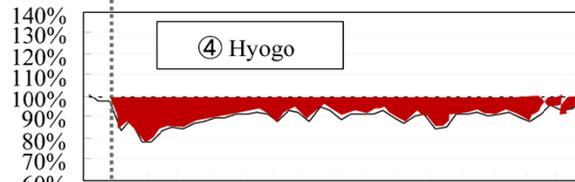
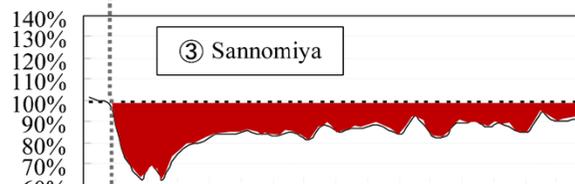
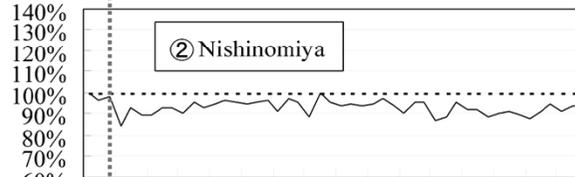
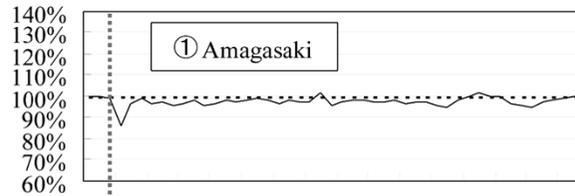
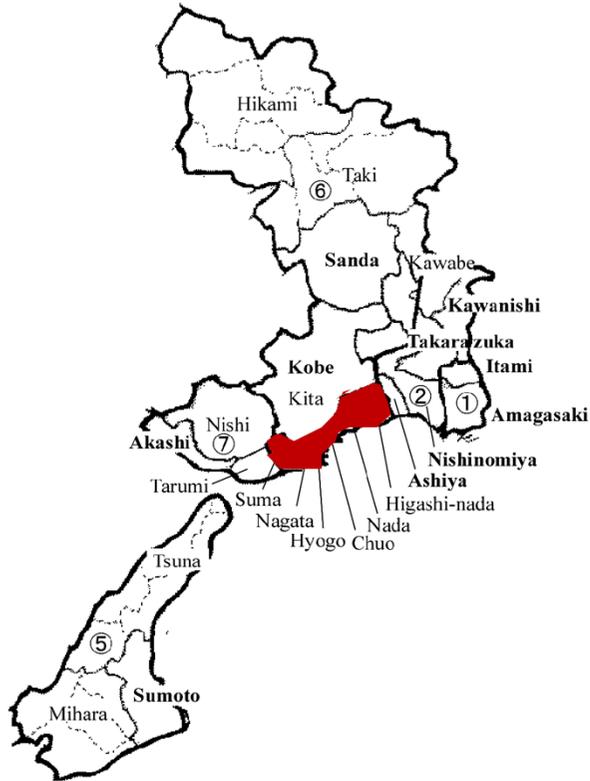
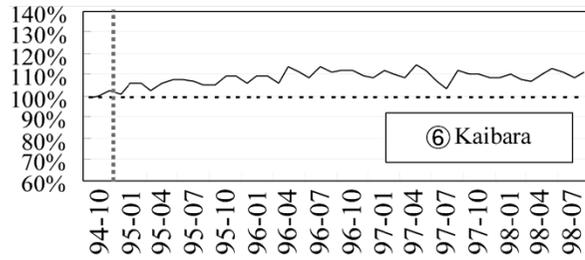
Economic Recovery

Revitalizing Local Economies:

Partially Success

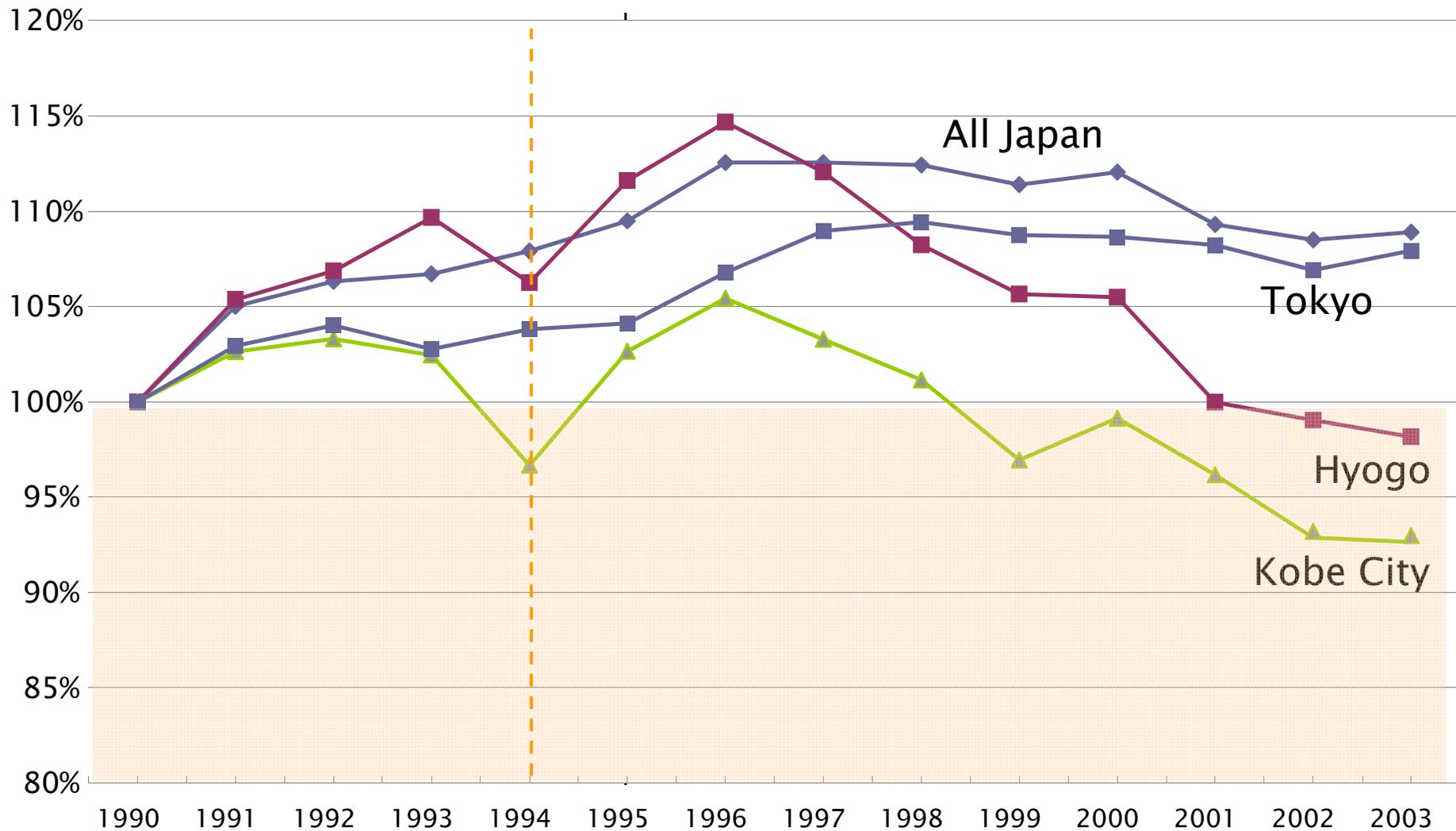


Monitoring Economic Recovery by Power Consumption



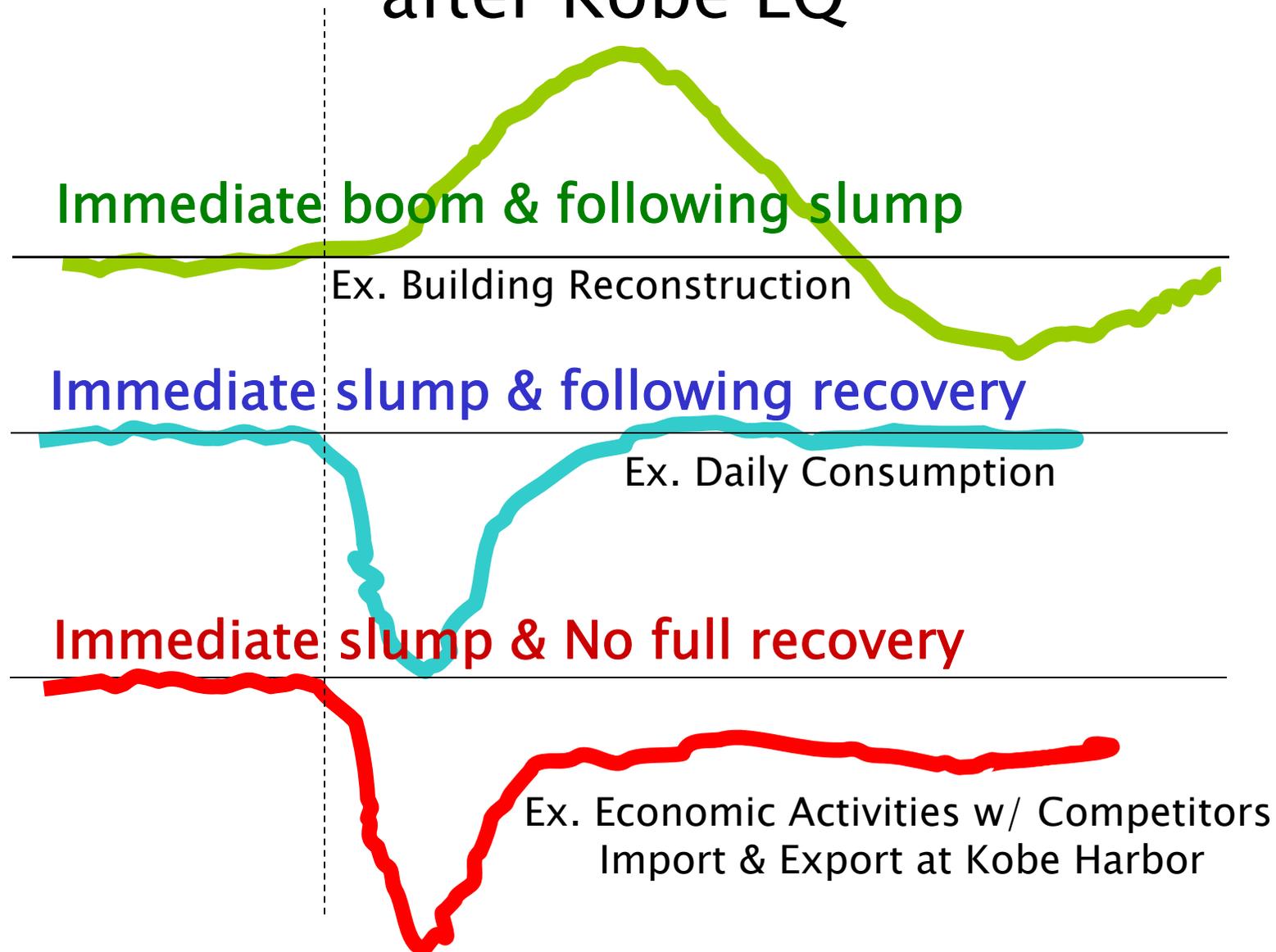


Changes in GDP & GRP after Earthquake



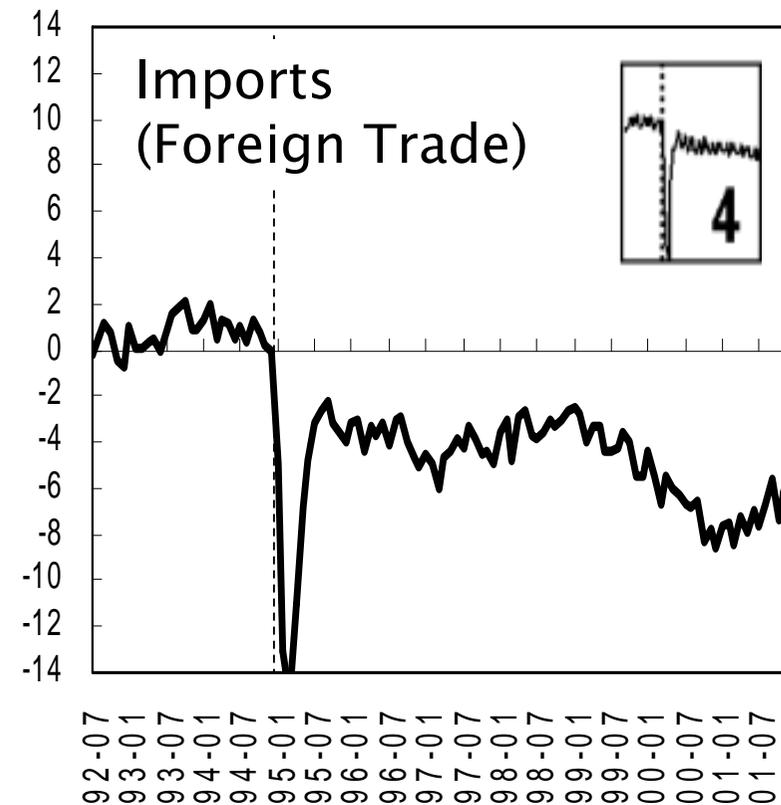
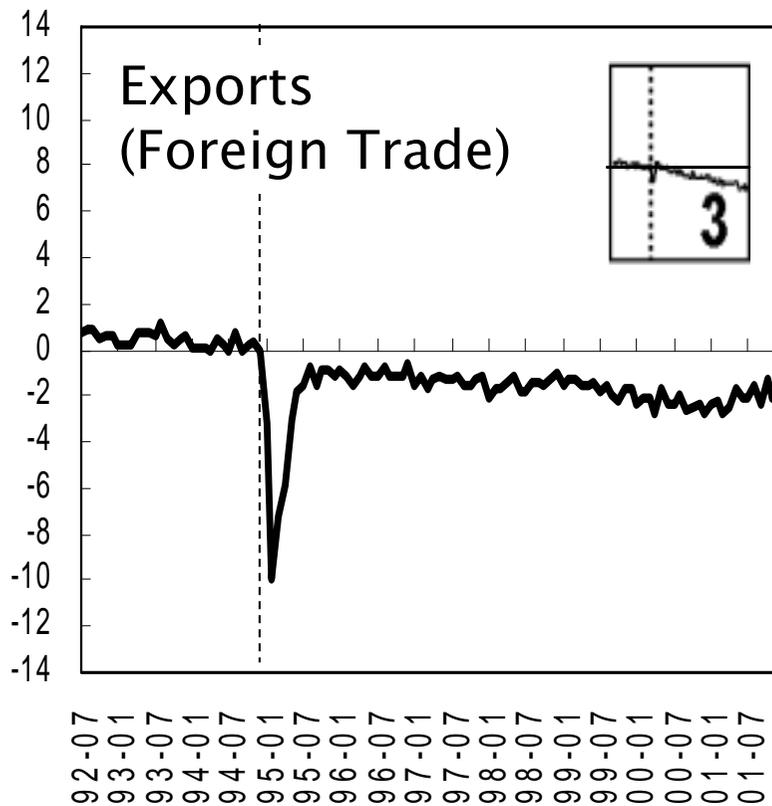


Three Basic Economic Recovery Patterns after Kobe EQ





Monitoring Economic Recovery by City Statistics





Why Partial Success

- Over-concentration of national government money and work for a very short time period killed local business recovery
 - Major Contractors in Tokyo got contracts
 - Little “Trickle-down” effect for local small business
 - 10 years worth housing renewal was completed in 3 years, followed by big economic slump
- Over-reliance on Public Spending by Victims
 - Little Initiative for Promoting a New Economy Development
 - Government was the only risk taker
- Customers Never Waited for recovery
 - Shift to competitors and never returned to old days
 - Importance of Business Continuation Plan



Life Recovery

Helping Disaster Victims:

Partial Success

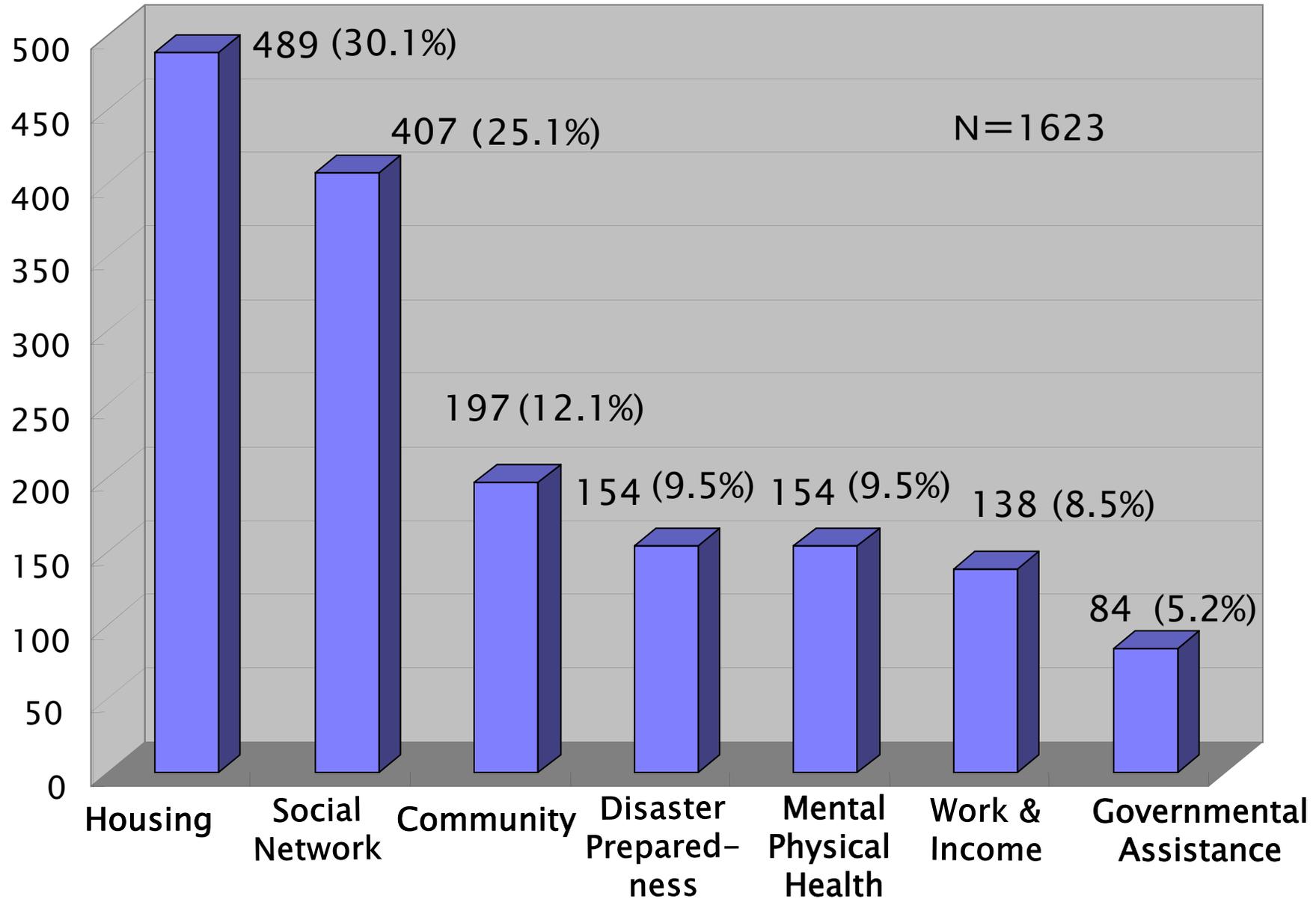


Life Recovery

- New Concept and Development
- 3.5 million disaster victims
- Nobody Can Define
 - Scope of Work
 - Desired End State
 - Need for Ethnographic Inquiry of Meaning of Recovery
- Public Help was provided mainly for Low-Income and/or Senior Citizens

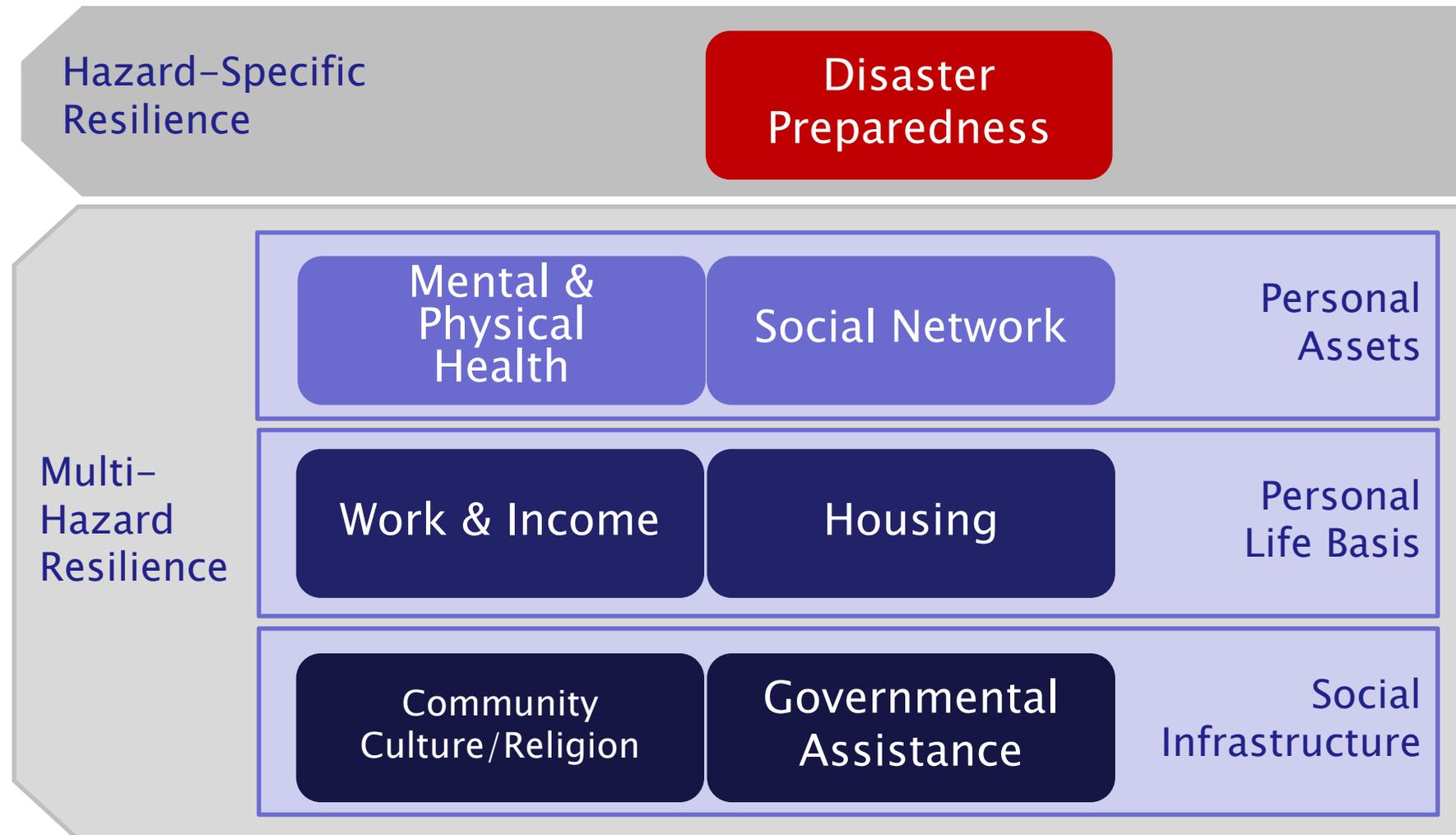


Seven Elements for Life Recovery



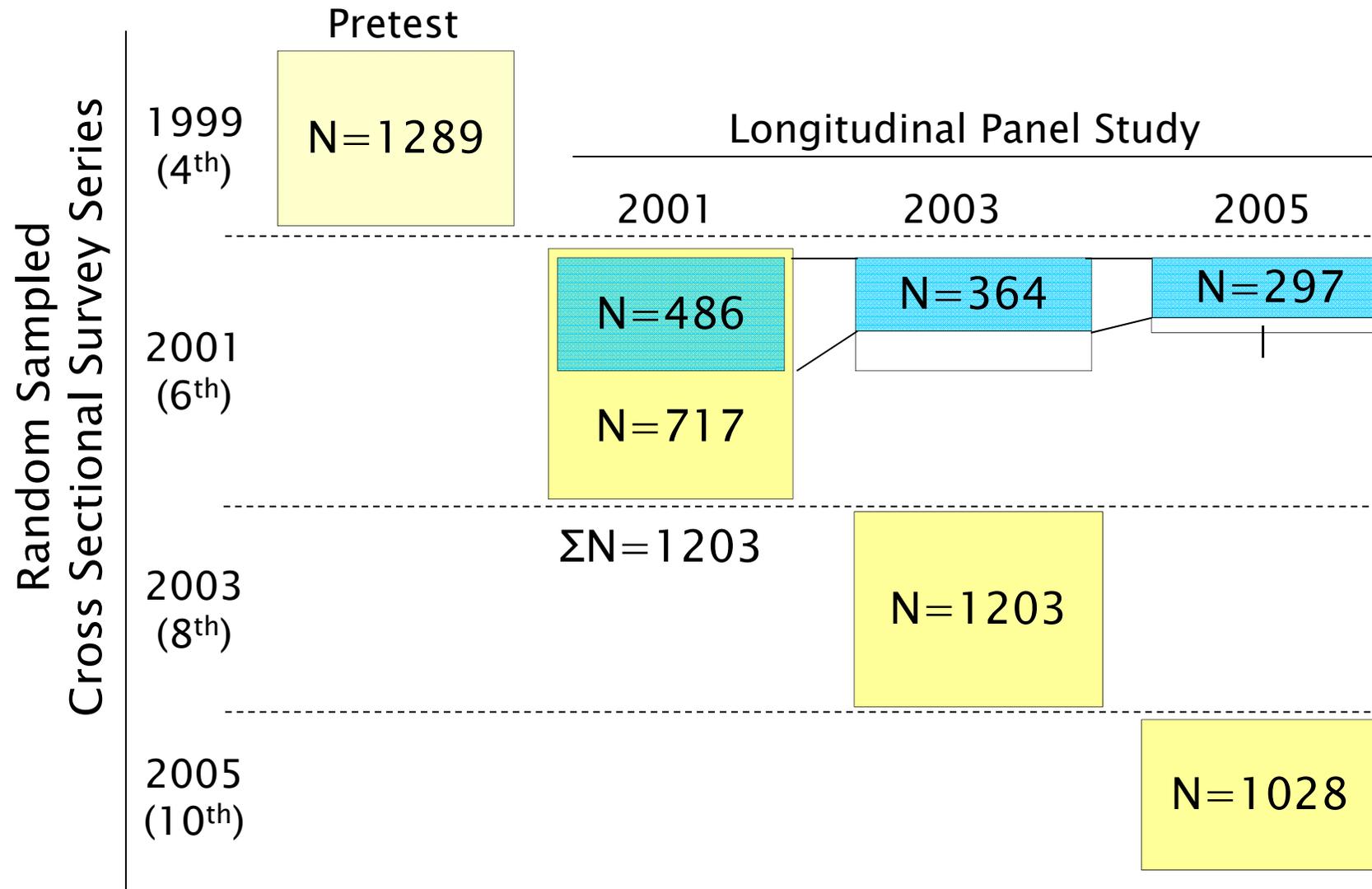


Life Recovery Model





Holistic Recovery Research by Hyogo Prefecture and Kyoto University

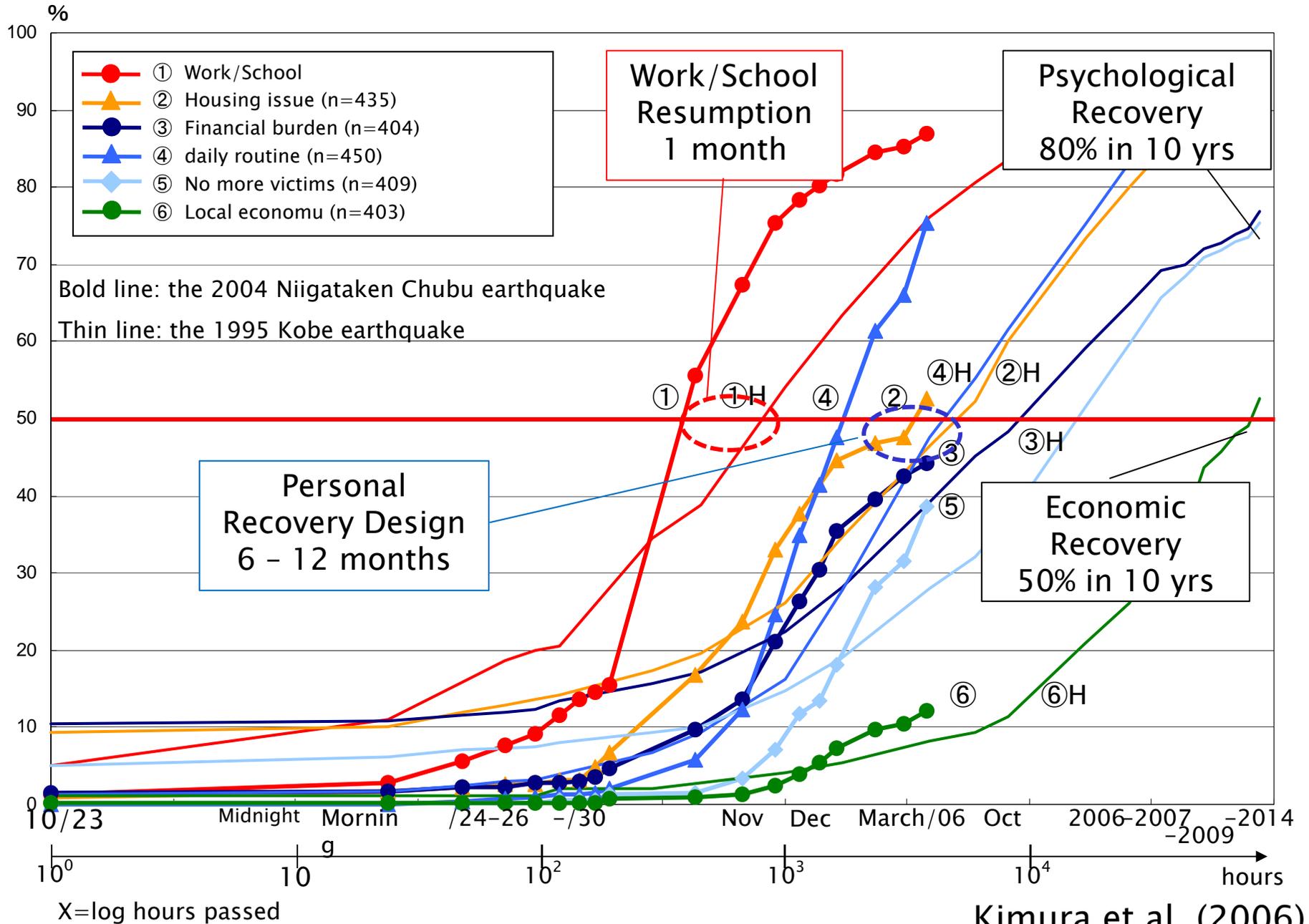




Recovery Timeline

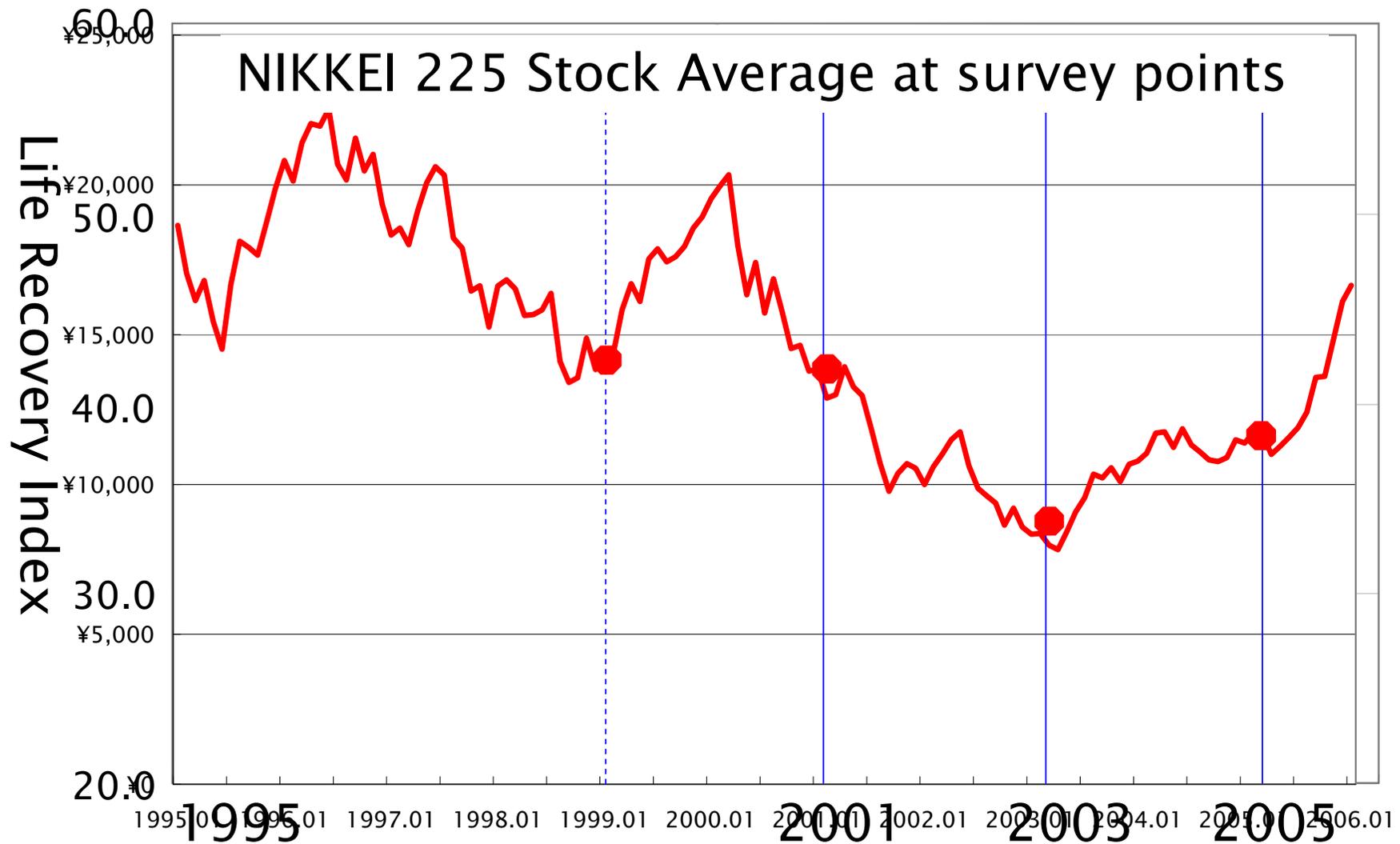
- When the disaster victims thought the followings were recovered or restored
- Chronological Change in Percentage of those who thought recovered in terms of log scale

- Work and/or School (n=405)
- ▲— Housing issues (n=435)
- Financial burden (n=404)
- ▲— Daily routine (n=450)
- ◆— No more victims (n=409)
- Local economy (n=403)





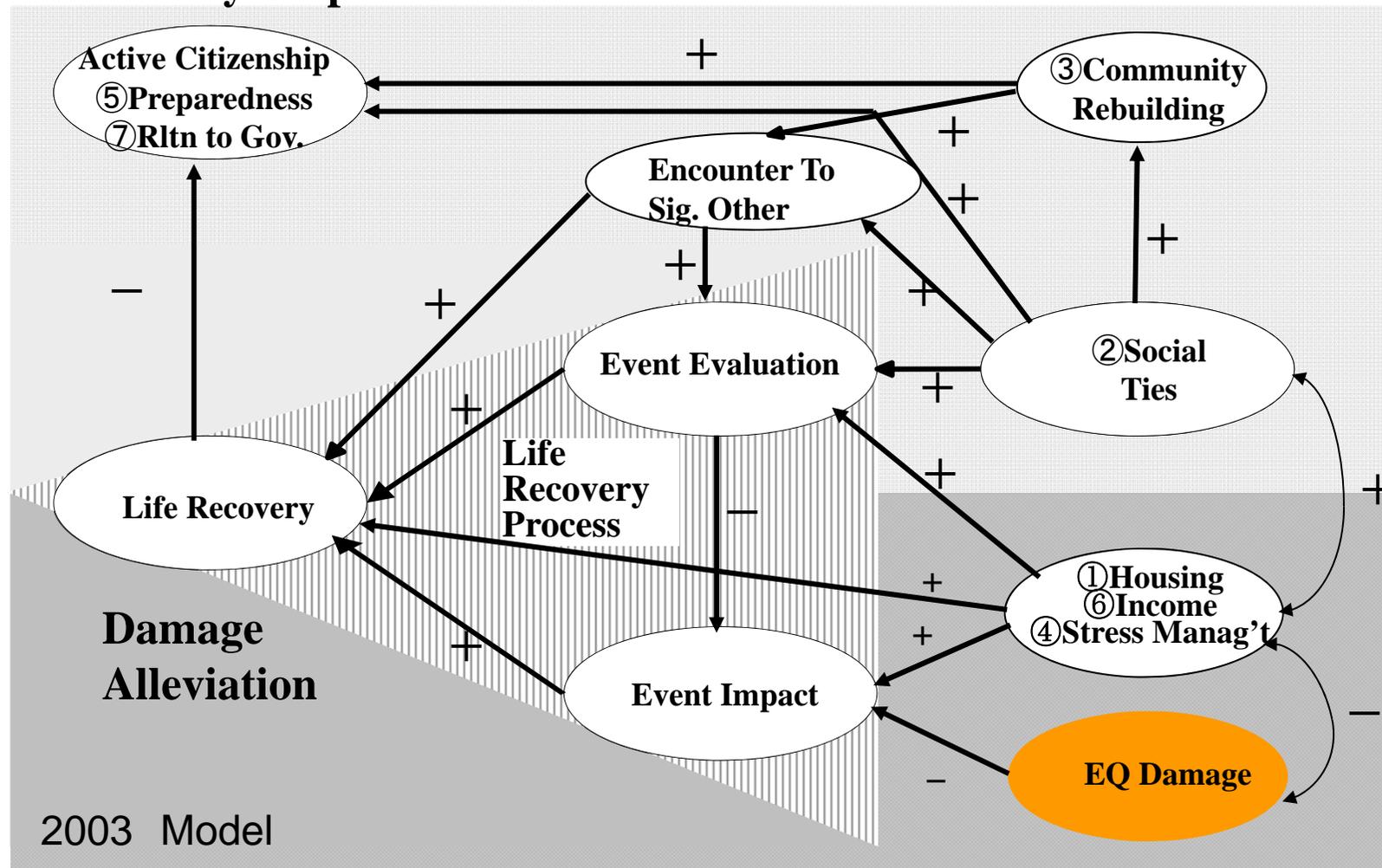
National economy strongly influences Life Recovery





Bird's-eye view of life recovery process: The 2003 study results (N=1,203, Jan. 2003)

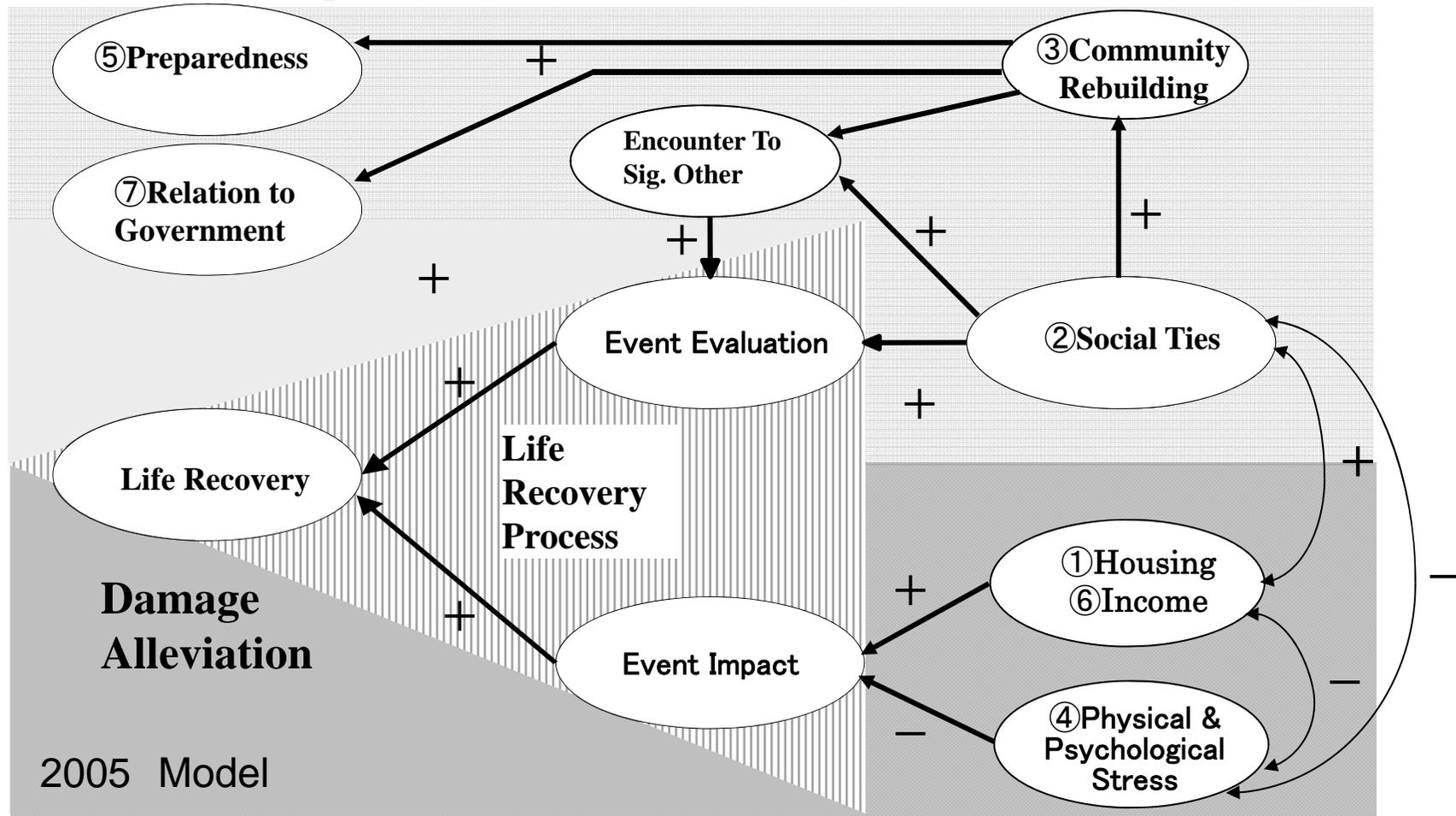
Community Empowerment





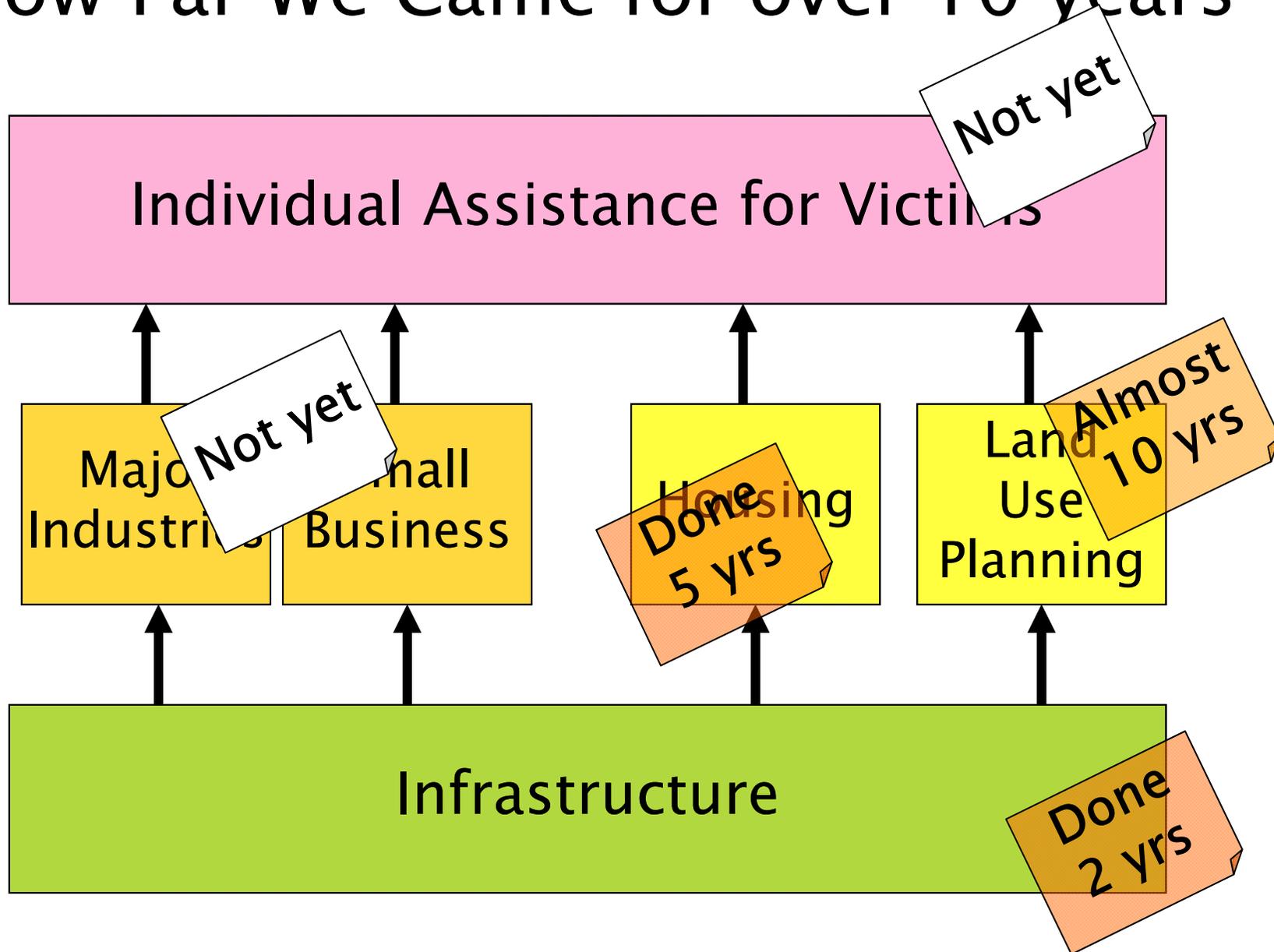
Bird's-eye view of life recovery process: The 2005 study results (N=1,028, Jan. 2005)

Community Empowerment



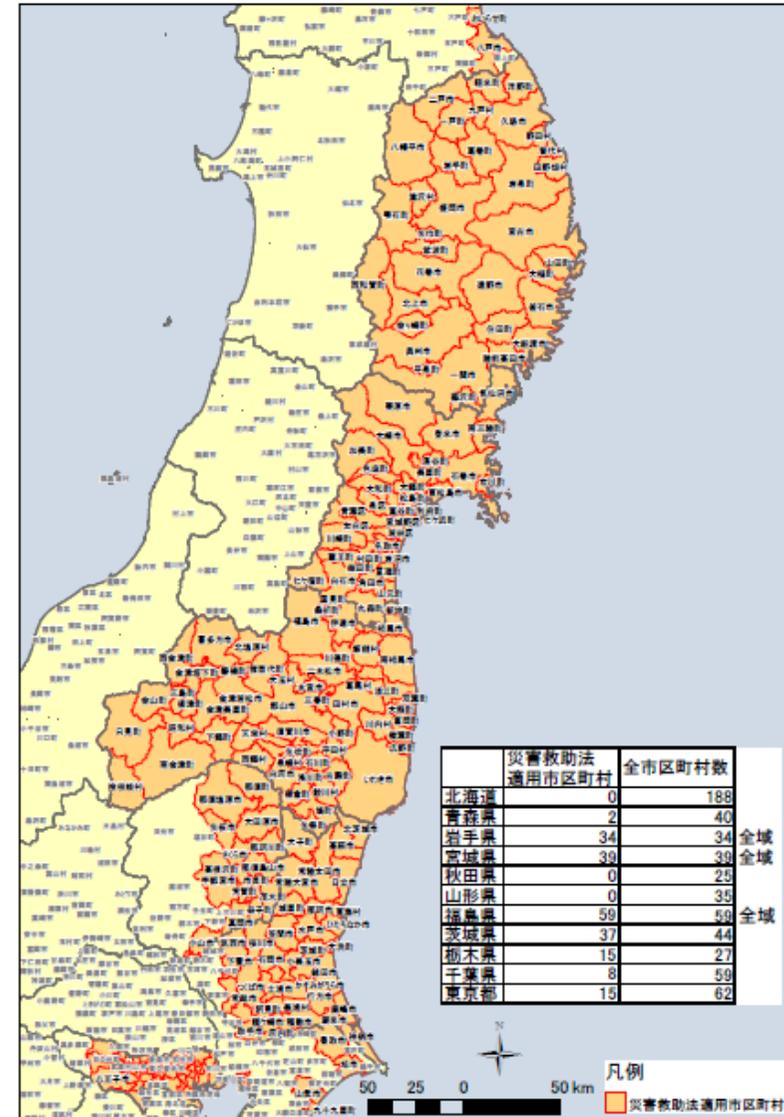


How Far We Came for over 10 years



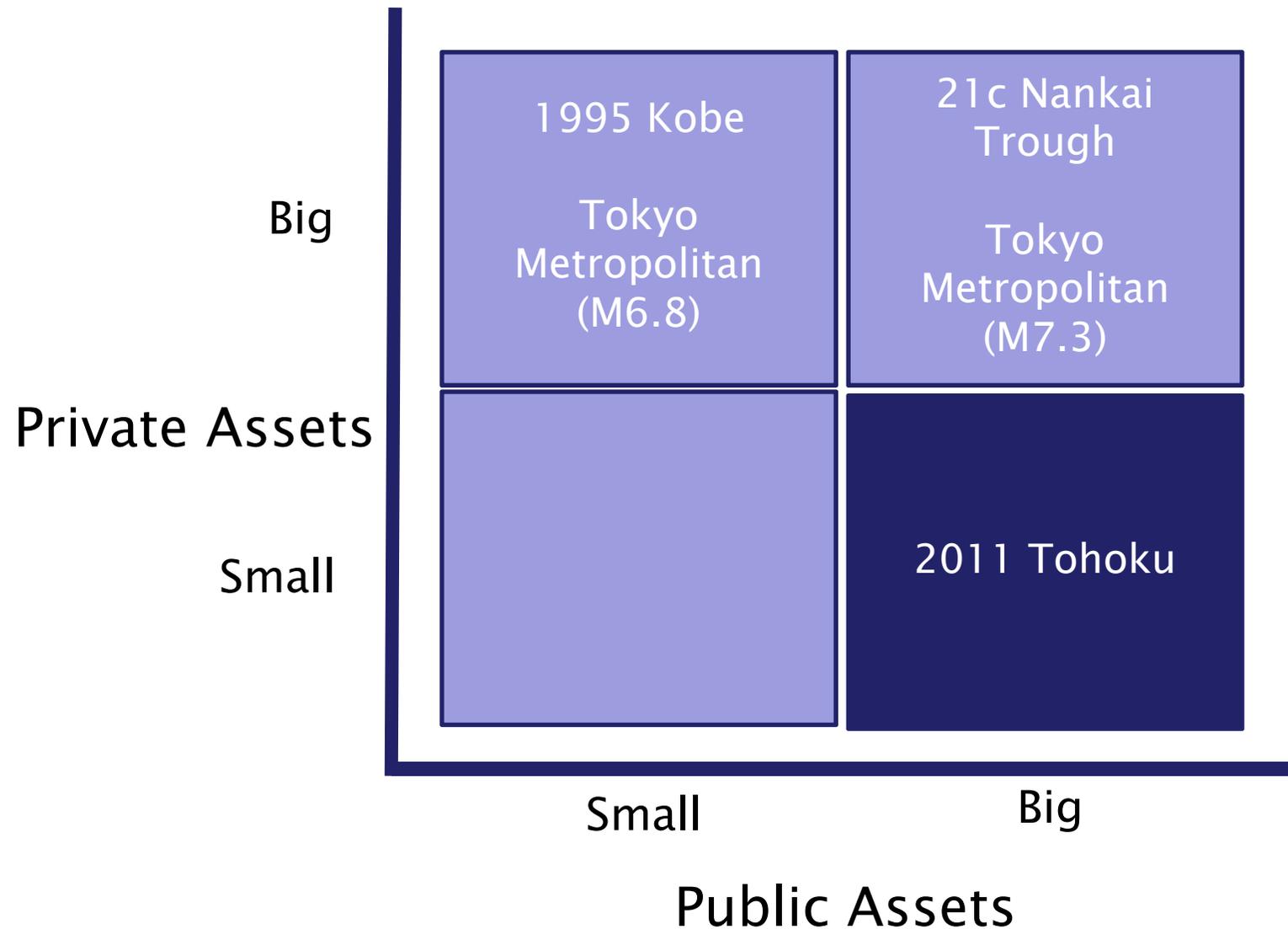
A Landscape-scale Disaster

- The number of jurisdiction applying Disaster relief Law
- Expenses will be reimbursed by the national government
- Kobe: 20 Jurisdictions
- Tohoku: 209 Jurisdictions



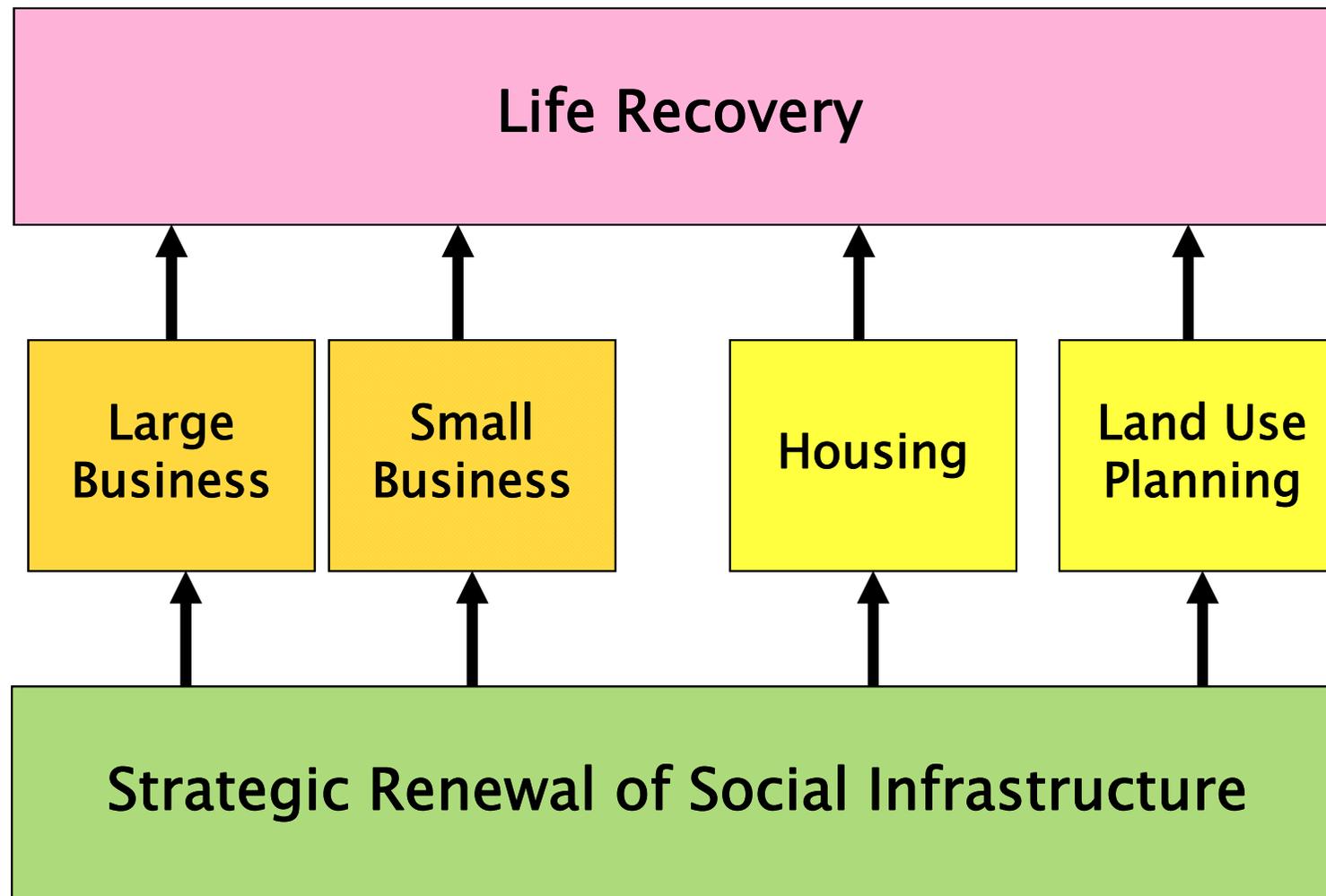


Major Earthquake Disasters





2011 Tohoku Recovery Plan (Should be)



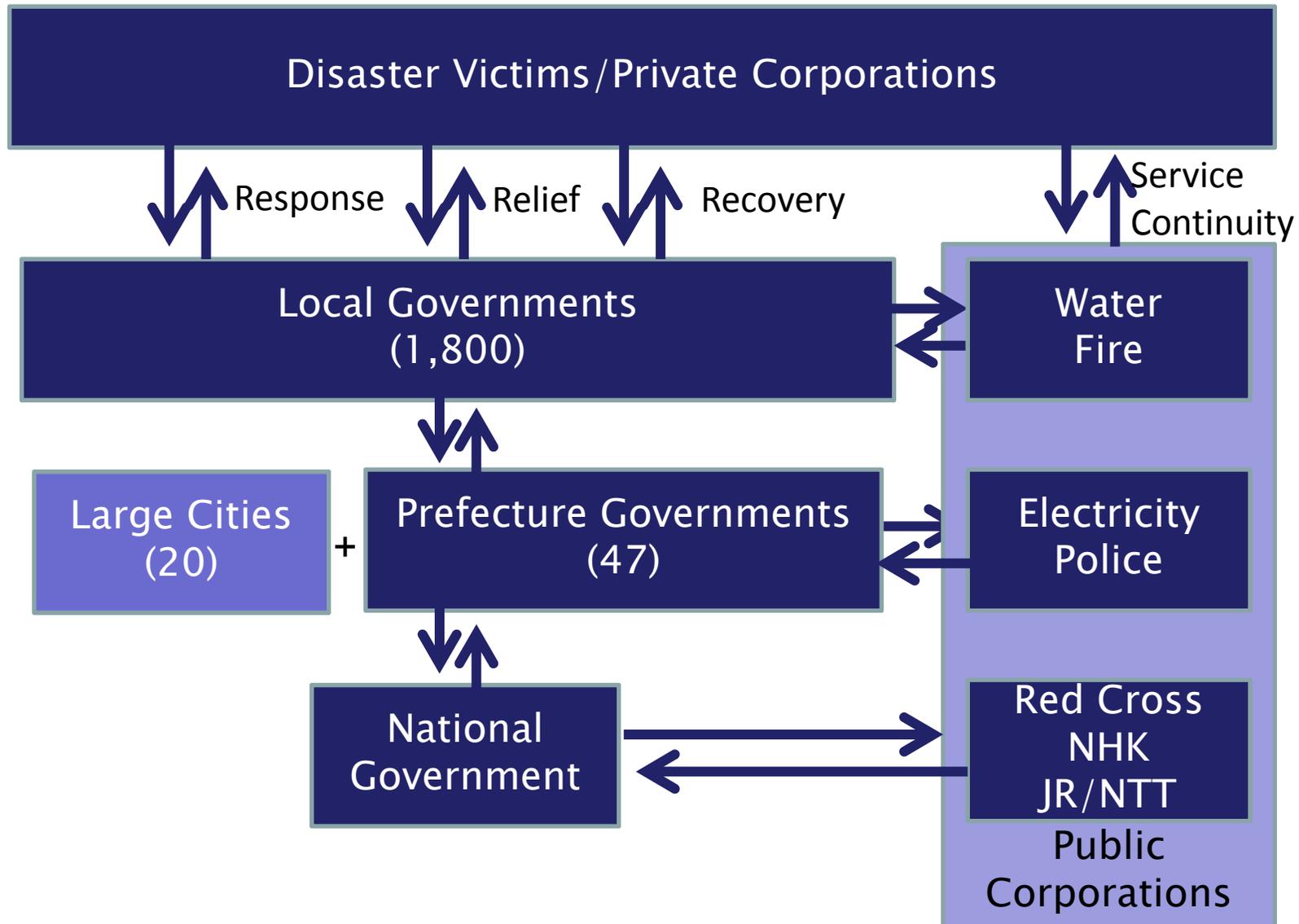


What was needed

- National Initiative
- with all stakeholders
- by a collaboration of all ministries and agencies
- for a sustainable economic development
- to rearrange infrastructures at a safer places
- based on strategic plan
- as soon as possible



Japanese Disaster Management System maybe



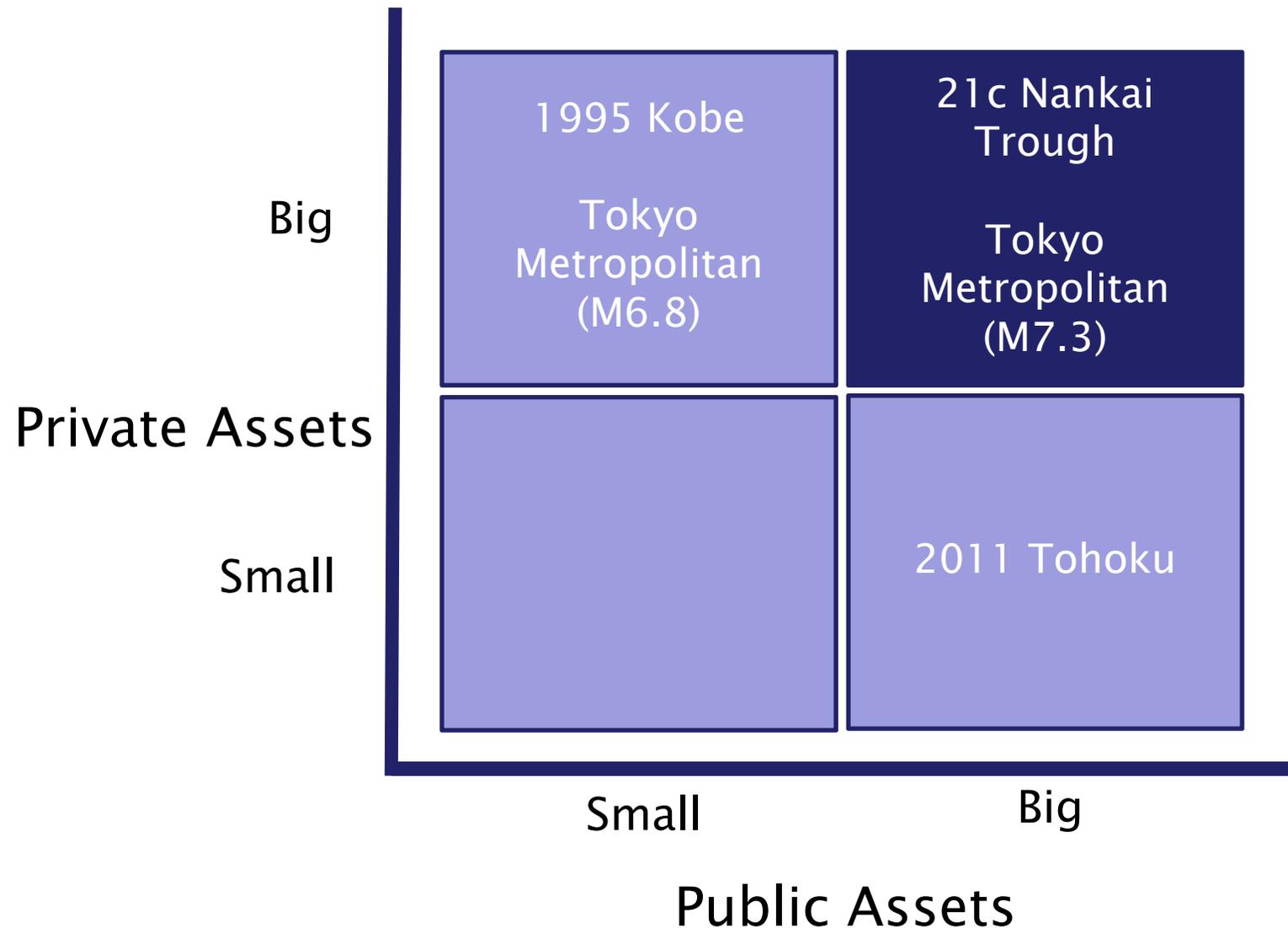


Three Types of Disaster Recovery

Level	Level 1	Level 2	Level 3
Type	<i>fukkyū</i>	<i>fukkō</i>	
		Reconstruction	Renewal
Damage	Limited	Devastating	Widely Spread
Hazards	Level 1 Shaking Level 1 Tsunami	Level 2 Shaking Extended Fire	Level 2 Tsunami
Goal	Get back as it was as soon as possible	Get back as it was with improvement	Find a new Sustainable way of life
Agent	Local Government	Prefecture/Large city	National Government
Infrastructure recovery	Restoration of present Infrastructure	Restoration of pre-dent Infrastructure	Strategic relocation of Infrastructure
Life recovery	Disaster Relief Law Life Recovery Fund	Local Block Grants	Strategic Recovery Funds
Examples	2004 & 2007 Niigata	1995 Kobe Tokyo (M6.8)	2011 Tohoku 21c Nankai Trough Tokyo (M7.3)



Major Earthquake Disasters



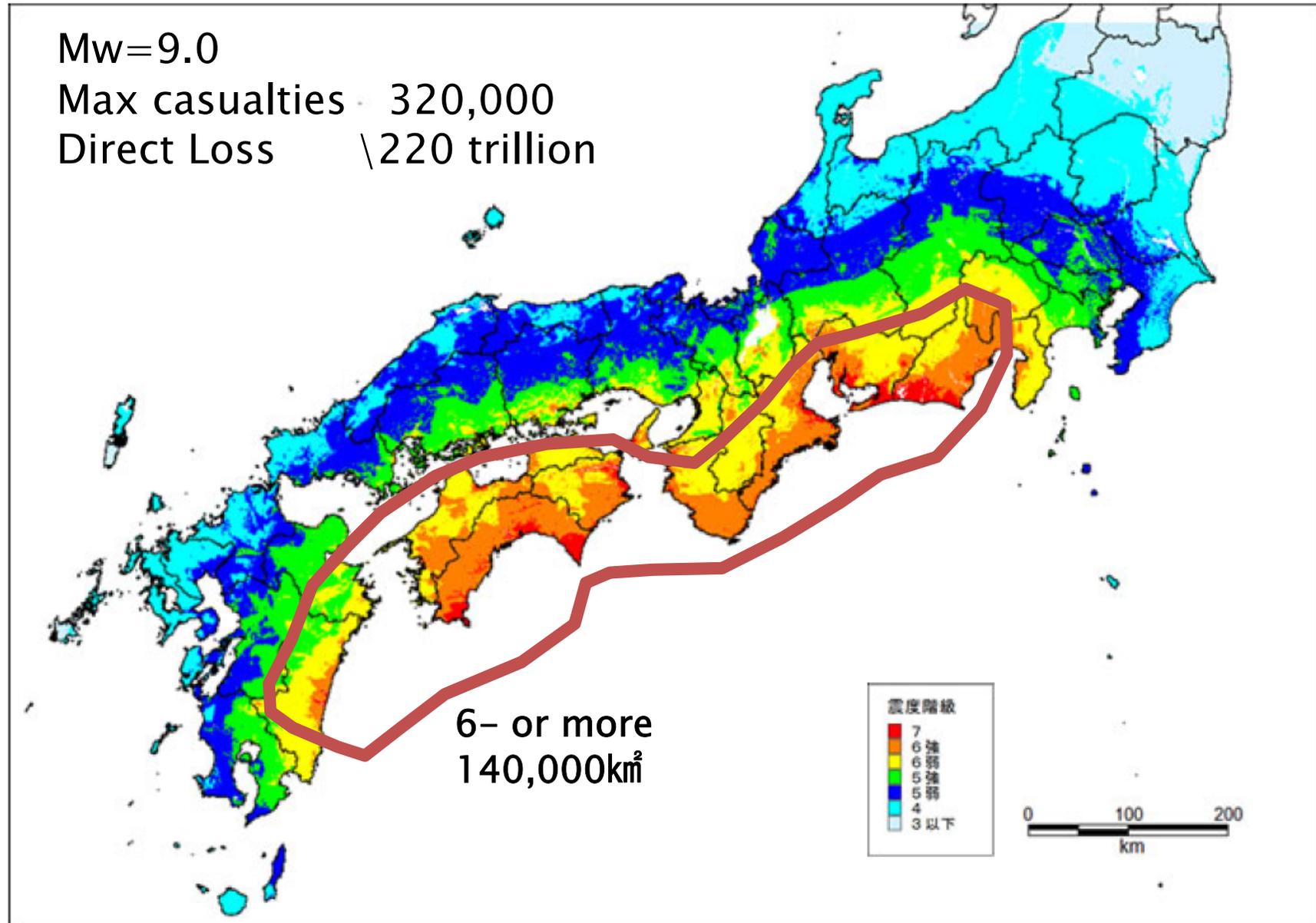


Nankai Trough 2012 Scenario

Mw=9.0

Max casualties 320,000

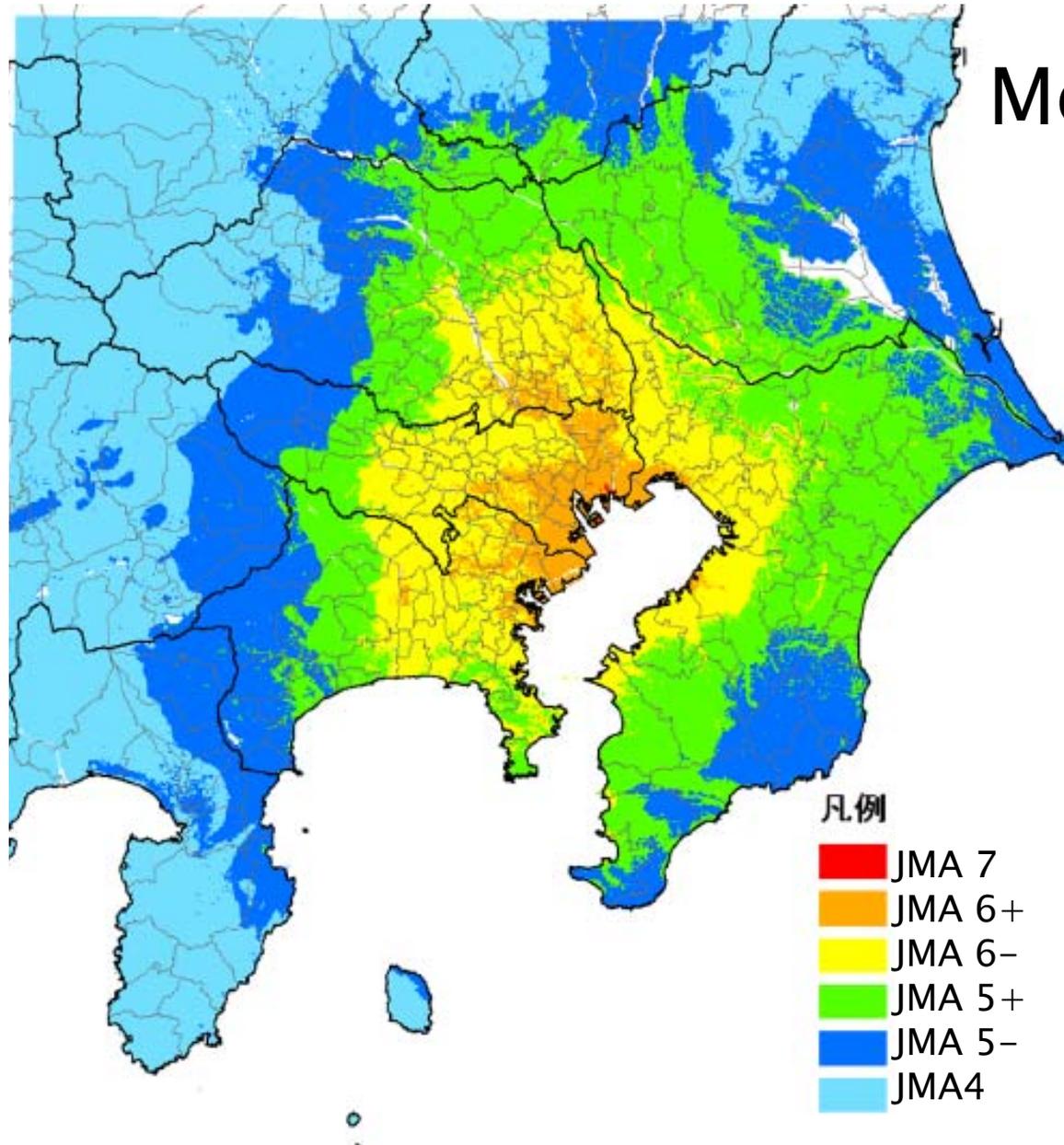
Direct Loss ¥220 trillion





Near Field Tokyo 2013 Scenario

Metropolitan South Mw=7.3



- 70% for next 30 yrs
- Casualties
 - Min 4,930
 - Max 22,460
- Direct Loss
 - \95 trillion
- Exposure

	2013	2005	Diff
JMA 7	0.014	0	+ 0.014
JMA 6+	8.800	5.000	+ 3.800
JMA 6-	20.500	20.400	- 0.100
Total	29.300	25.400	+ 3.900



Huge Damage is expected

Earthquake	Nankai Trough (Tōkai, Tōnankai, Nankai)		Near Field Tokyo		Tohoku 2011	Kobe 1995
	2012 Scenario	2003 Scenario	2013 Scenario	2005 Scenario		
Magnitude	M9.0	M 8 .7	M7.3	M 7.3	M 9.0	M 7.3
Killed/missing	80,000 – 320,000	24,000	5,000 – 22,500	11,000	19,294	6,434
Injured	257,000 – 623,000	300,000	90,000 – 120,000	240,000	6,100	44,000
Buildings- collapsed	627,000 – 1,346,000	450,000		200,000	126,500	105,000
Building- heavy damage	----	----	----	-----	227,600	144,400
Buildings- burned	50,000 – 750,000	90,000	38,000 – 412,000	650,000	---	7,400
Evacuees (max)	----	6,000,000	7,200,000	7,500,000	480,000	320,000
Direct Damage (\trillion)	220	81	95	112	17	10



Towards Integrated Model of Recovery

Relationship among Three Goals

Economic Recovery

Revitalizing
Local Economies

as a Result

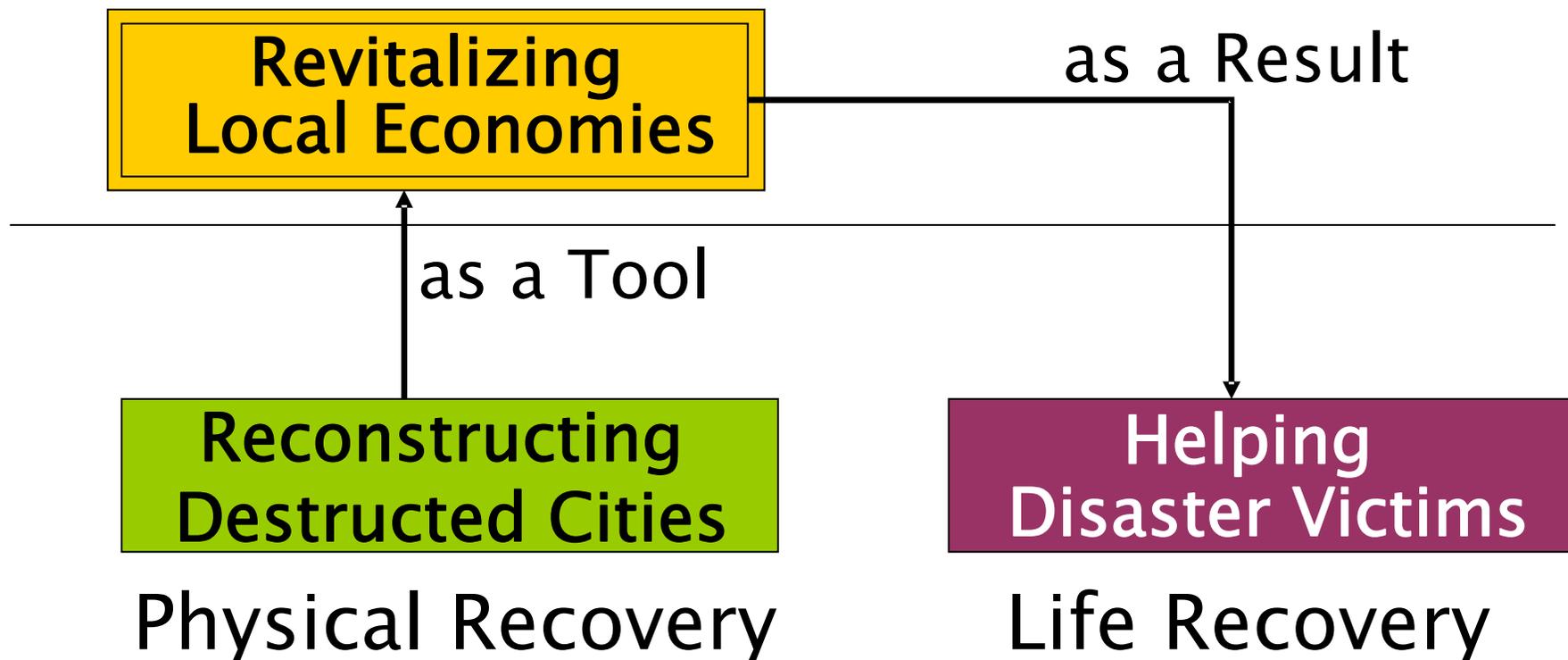
as a Tool

Reconstructing
Destroyed Cities

Helping
Disaster Victims

Physical Recovery

Life Recovery





Towards Integrated Model of Recovery Relationship among Three Goals

- Programs
 - Life recovery is the ultimate goal
 - Use both Direct and Indirect Measures
 - Economic recovery is an indirect measure for life recovery
 - Physical recovery is an indirect measure for economic recovery
- Funding Mechanism
 - Identify Funding sources, Managing Authorities, and Operating Agencies
 - National Government is not a single resource
 - Community Block Grant Approach is recommended



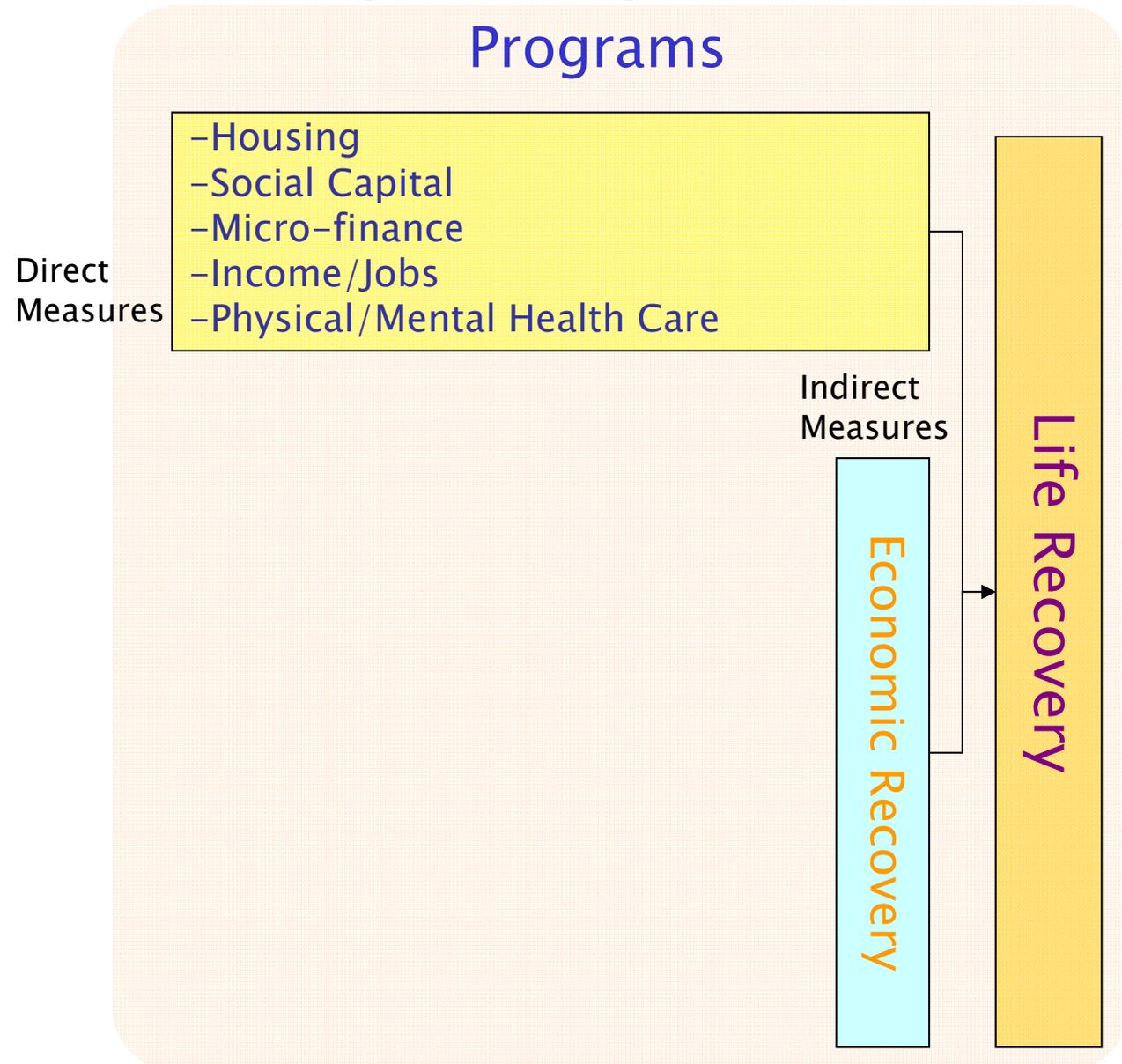
Holistic Recovery Policy Model

Programs

Life Recovery

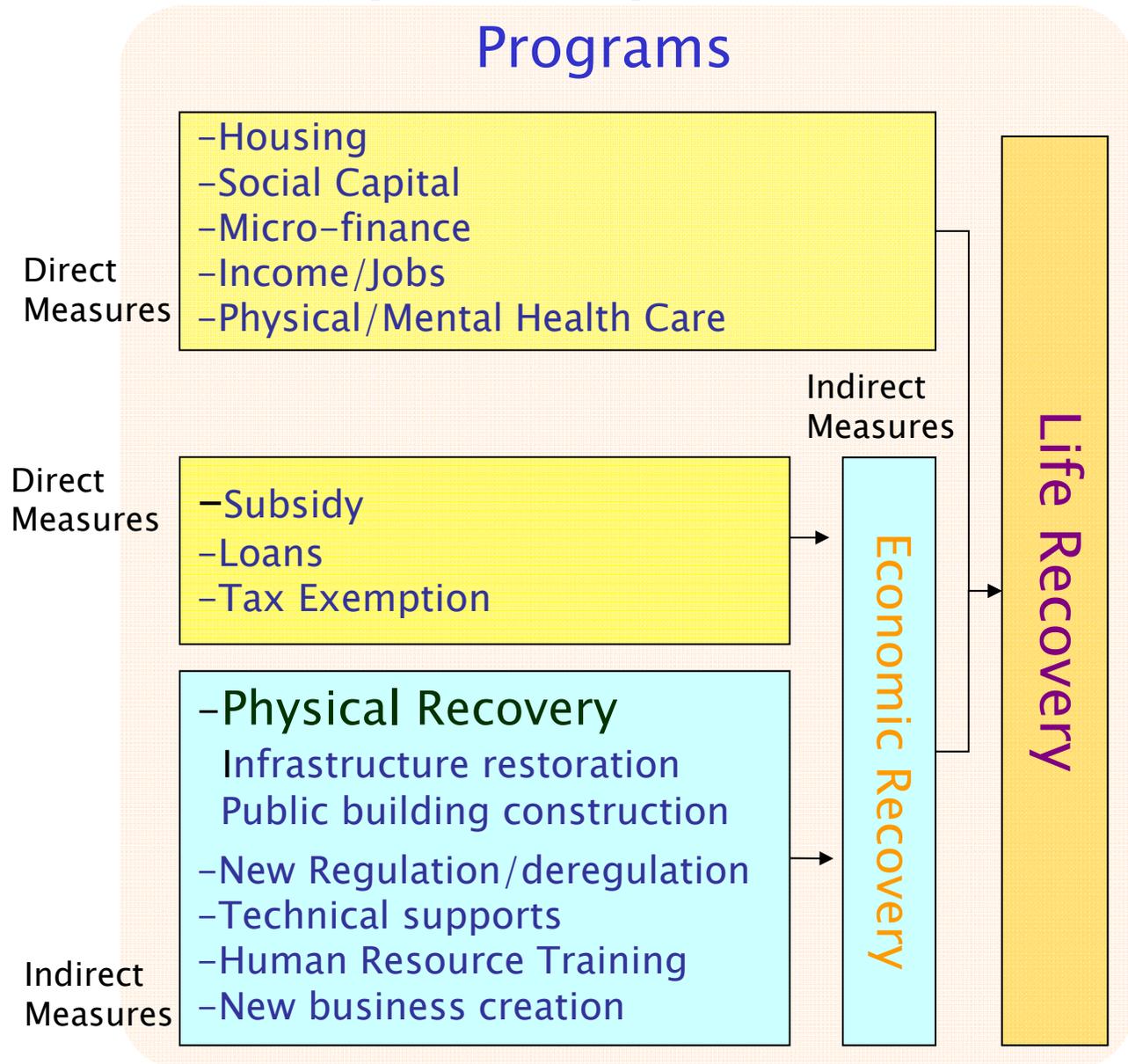


Holistic Recovery Policy Model



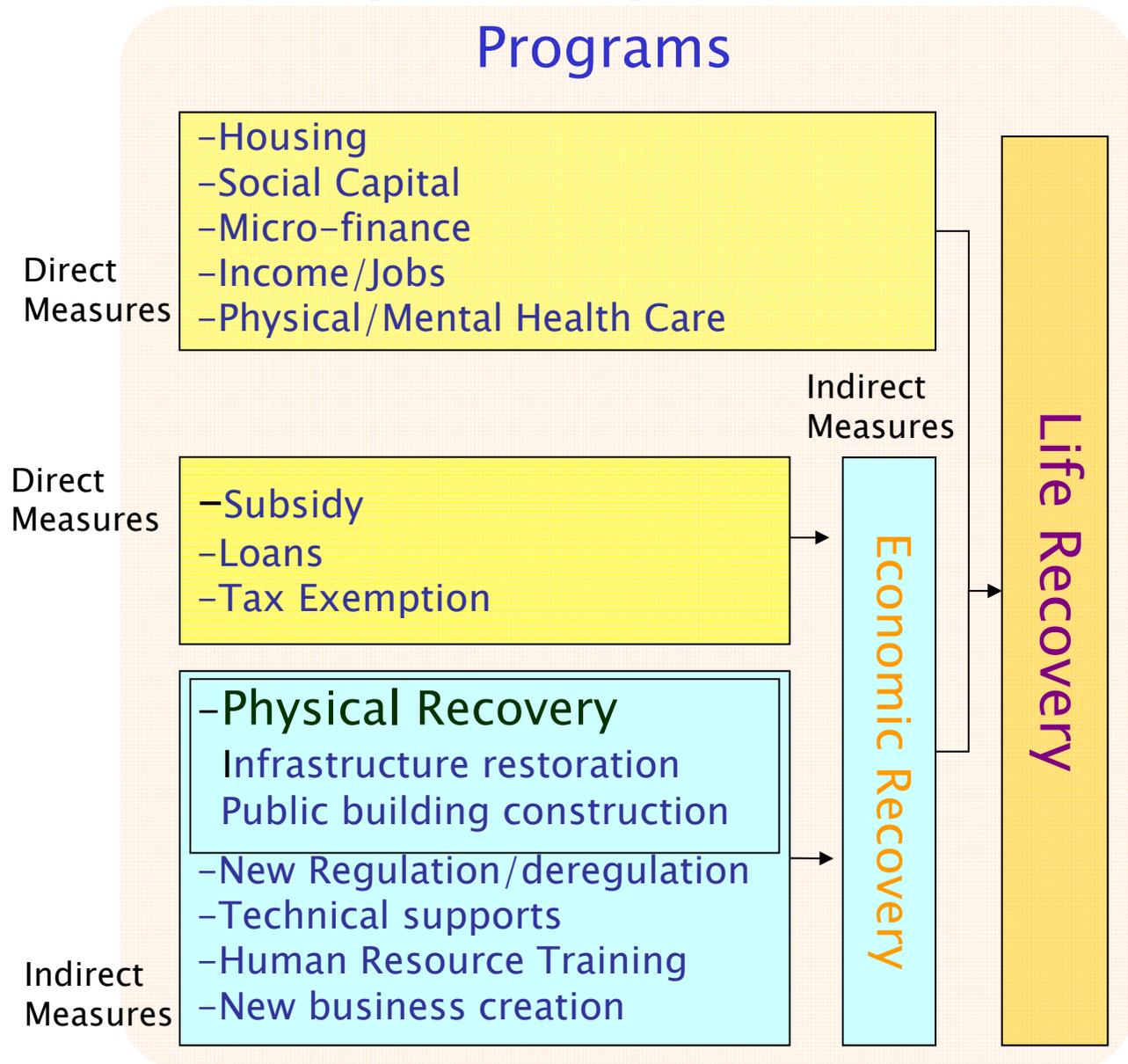


Holistic Recovery Policy Model





Holistic Recovery Policy Model





Holistic Recovery Policy Model

Funding Mechanism

Financial Sources



Managing Authorities

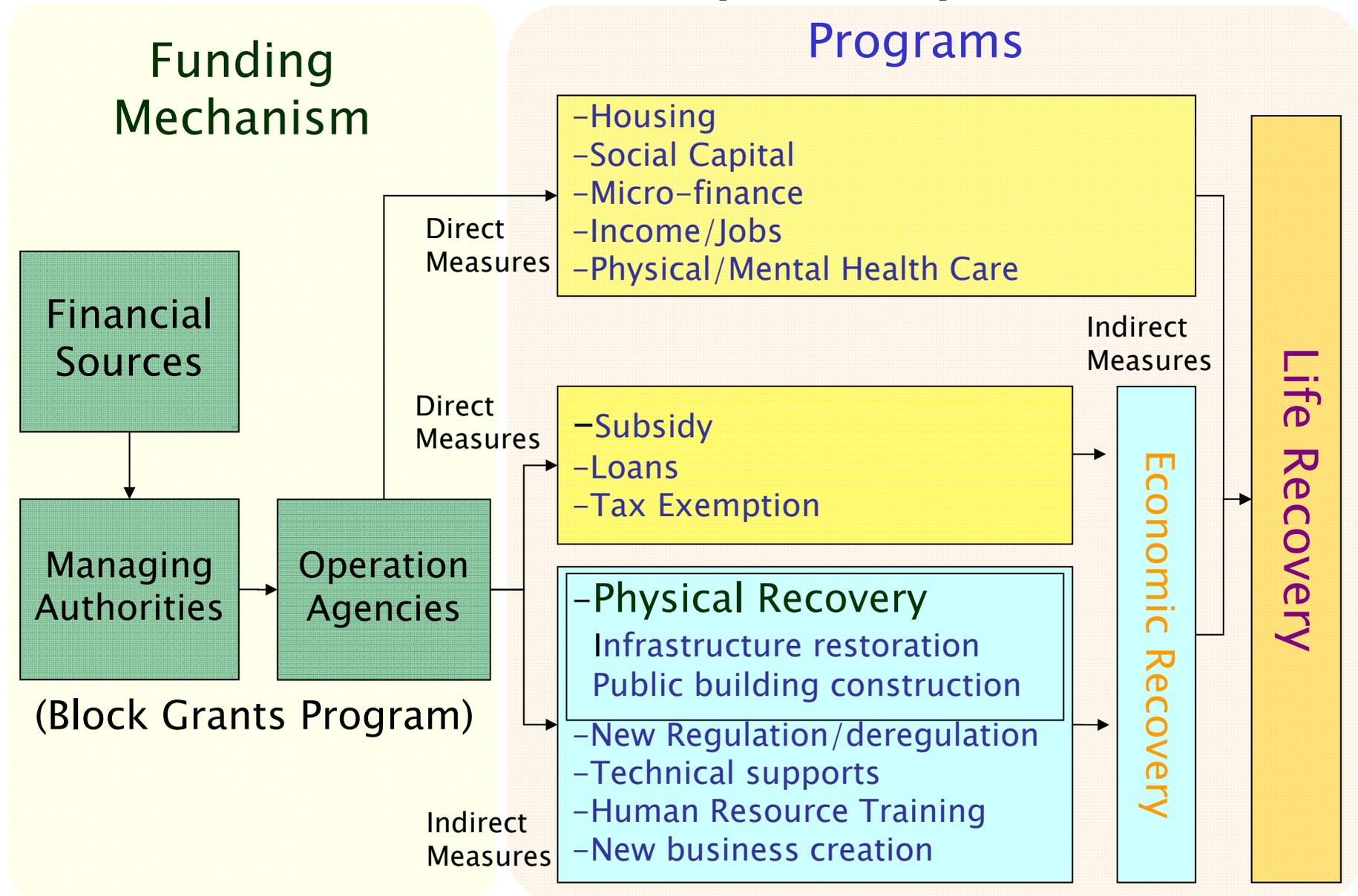


Operation Agencies

(Block Grants Program)



Holistic Recovery Policy Model





Conclusions

- Long Term Recovery is a time consuming and complicated process
- Long Term Recovery Management became an important new issue for disaster researchers and practitioners
- There are at least three goals of recovery to be achieved: Physical recovery, Economic recovery, and Life recovery
- Activities for achieving these three goals should be coordinated
- Economic recovery should be the prime target,
- Use physical recovery as the tool to achieve it, and
- Life recovery as a consequence
- Pre-planning of recovery strategy really helps prevent and reduce potential damages and coordination cost
- Recovery planning should be holistic in nature, and participatory in action
- Don't rush, take time for recovery



復興の教科書

<http://fukko.org/>

1995年1月17日に発生した『阪神・淡路大震災』の復興プロセスについて実施された『兵庫県生活復興調査』がベースとなっています。

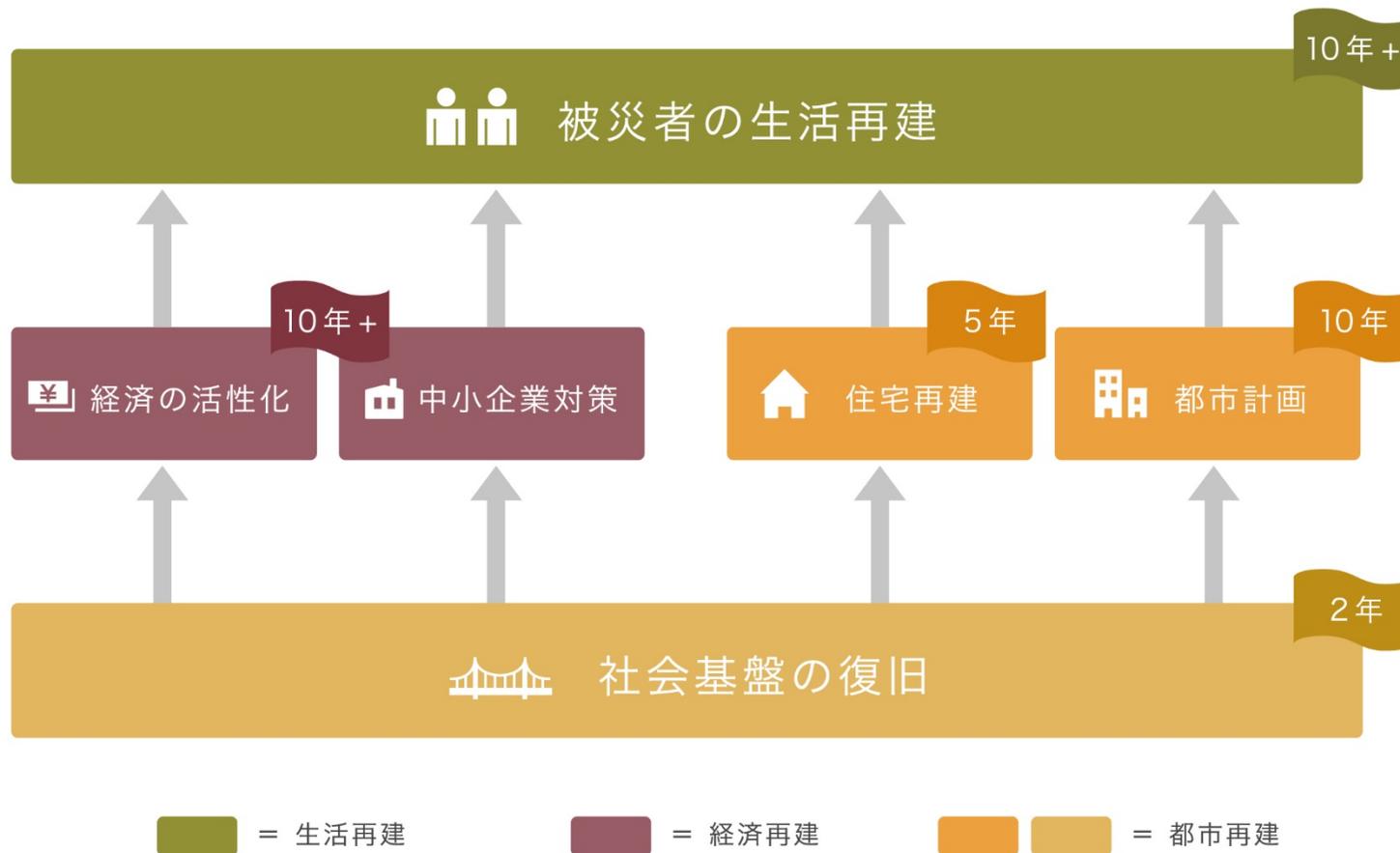
「何をすることが復興につながるのか？」「何をもちて復興したといえるのか？」を共有しないまま時間だけが過ぎていく現状があります。そのような状況を踏まえ、本サイトでは自治体職員やNPO団体、ボランティアなどの災害対応従事者が支援活動を行う上で参考になるような被災者視点の知見や行政施策を掲載しました。

The screenshot shows the homepage of the 'Fukko no Kyokasho' website. At the top, the title '復興の教科書' is displayed, followed by navigation links for '復興の教科書とは', '基礎知識', '被災者視点', '行政視点', and 'リンク'. A search bar labeled 'サイト内検索' is located in the top right. A large question mark icon is positioned on the left side of the main content area. To its right, a text block explains the site's purpose: '『復興の教科書』とは、大規模災害時における“復興とは何か？”について、【基礎知識】【被災者視点】【行政視点】の3つの切り口から学ぶことを目的としたサイトです。'. Below this, the content is organized into a grid of 12 colored boxes, each with an icon and a label: '基礎知識' (Basic Knowledge), '歴史' (History), 'モデル' (Model), 'フェーズ' (Phase), '被災者視点' (Disaster Victim Perspective), 'ニーズ' (Needs), 'データ' (Data), 'カレンダー' (Calendar), '行政視点' (Administrative Perspective), 'プラン' (Plan), 'スケジュール' (Schedule), and 'リンク' (Link). The footer contains the copyright notice: 'Copyright © 2014 Fukko no Kyokasho All rights reserved.'



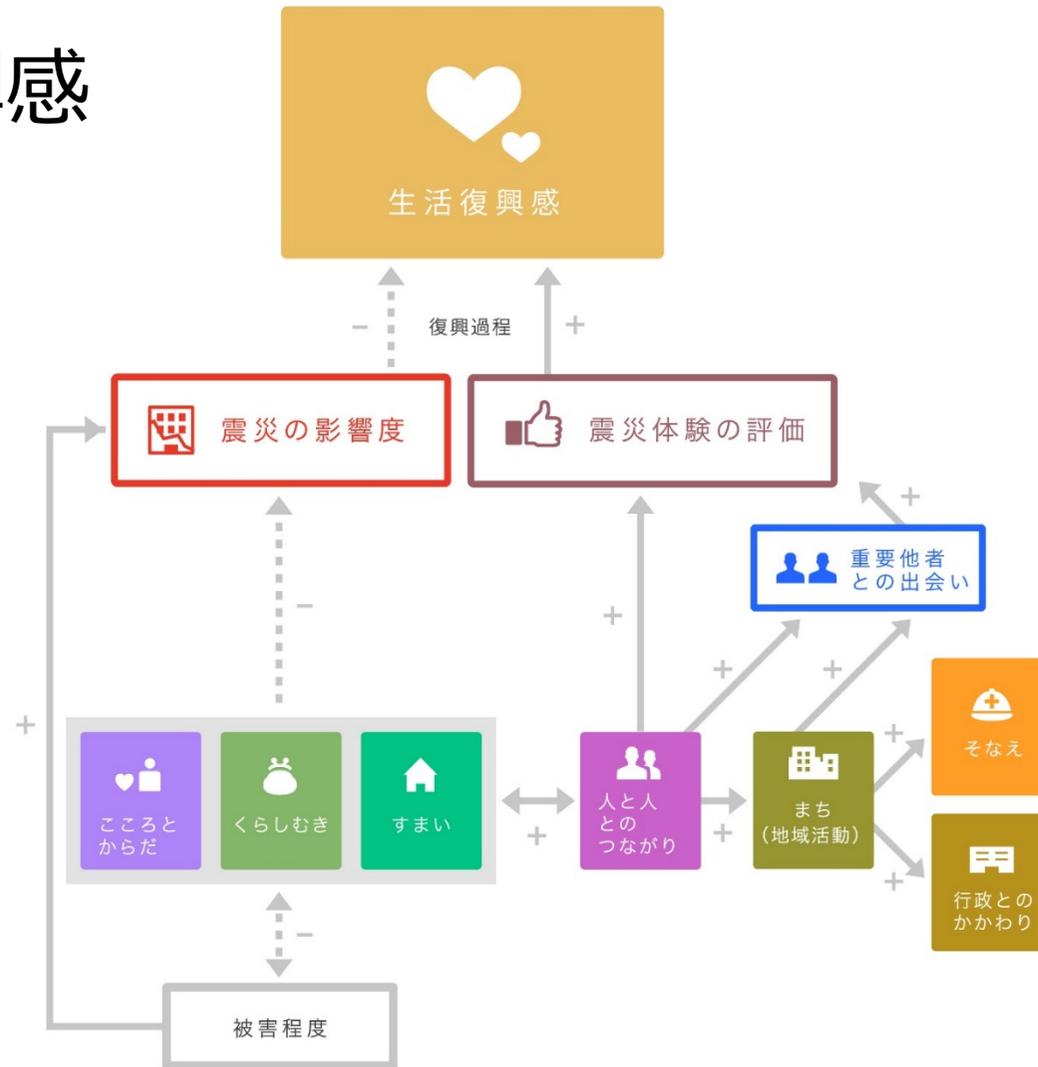
復興 3層モデル

【都市再建】 【経済再建】 【生活再建】 の3つを達成すべき目標とし、その復興過程を構造化





生活復興感



— 実線 : 正の関係 (一方が高まると他方も高まる)

... 点線 : 負の関係 (一方が高まると他方は低まる)

→ : 因果関係 (一方が他方に影響を及ぼす)

↔ : 相関関係 (両者が同時に変動する)