

## Coping with Natural Disasters in Japanese Urban Planning: How to Build Disaster Resilient Cities?



Disaster Prevention Base Shirahige Higashi,  
Sumida-ku

Pocket Park with underground water tank,  
Higashi Ikebukuro



# Coping with Natural Disasters in Japanese Urban Planning: How to Build Disaster Resilient Cities?

- 1. Introduction: The Big Earthquake Ahead – Lessons from Kôbe**
- 2. Damage Assessment and District-based Vulnerability in Tôkyô: Reflections of Physical and Socioeconomic Structures**
- 3. Earthquake-Related Disaster Prevention Planning and its Development Path in Tôkyô after the Second World War**
  - 1. Striving for Better Disaster Prevention in the Belt of Densely Built-up Wooden Houses in Tôkyô**
  - 2. Conclusion: Tôkyô on its Way Towards a Disaster Resilient City**

# Coping with Natural Disasters in Japanese Urban Planning

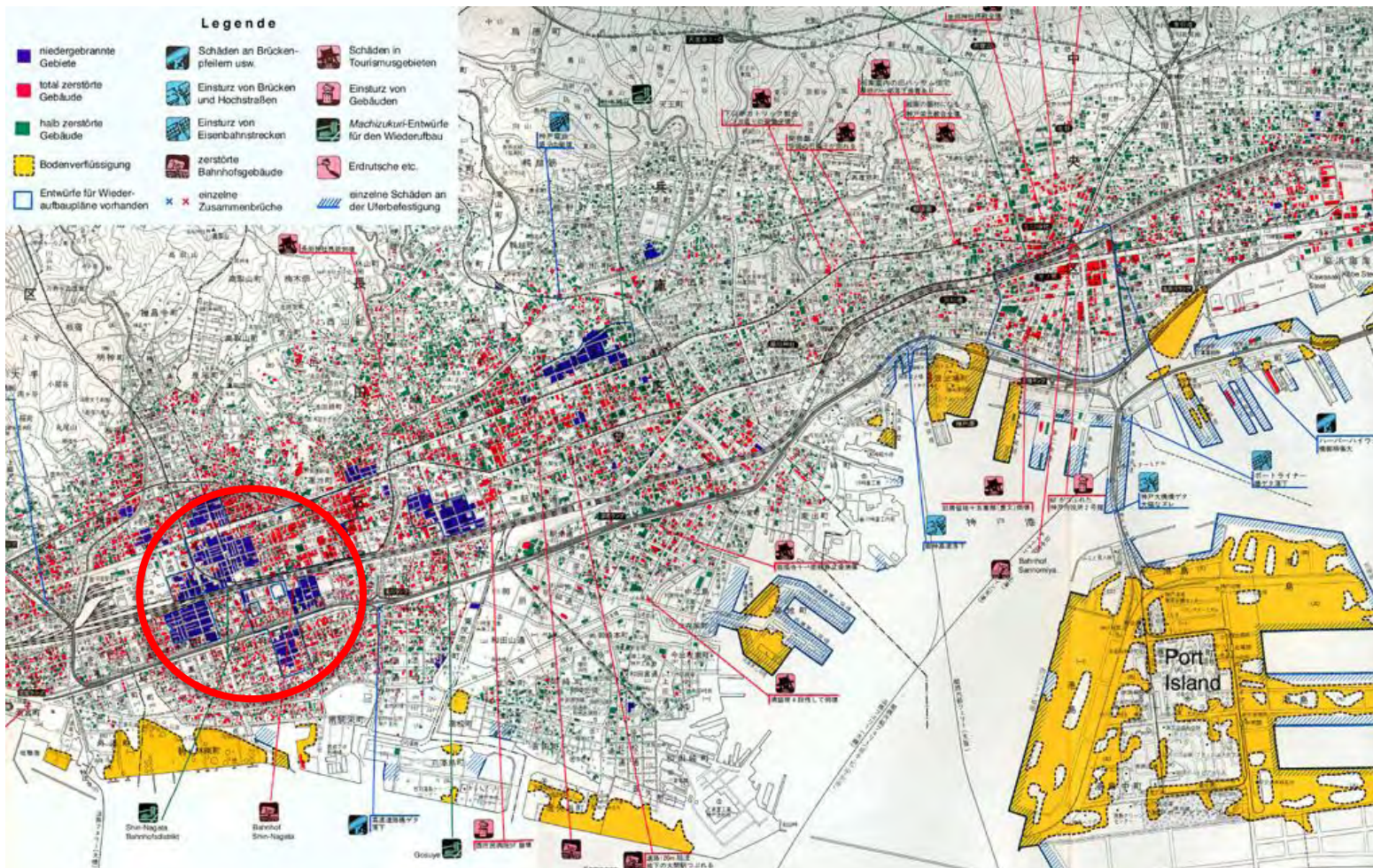
## 1. Introduction: The Big Earthquake Ahead – Lessons from Kôbe



**January 17th, 1995: Kôbe – not Tôkyô!**



## 1. Introduction: The Big Earthquake Ahead – Lessons from Kôbe



Hanshin daishinsai chizu. May 1995 (violet: burnt down areas, red: totally destroyed buildings, green: semi-destroyed buildings, yellow: areas with ground liquefaction)

# Coping with Natural Disasters in Japanese Urban Planning

## 1. Introduction: The Big Earthquake Ahead – Lessons from Kôbe



**Disruption of Infrastructure Lifelines**



# Coping with Natural Disasters in Japanese Urban Planning

## 1. Introduction: The Big Earthquake Ahead – Lessons from Kôbe



**Temporary Housing  
on Port Island 1996**



## Coping with Natural Disasters in Japanese Urban Planning

### 1. Introduction: The Big Earthquake Ahead – Lessons from Kôbe

Integration of hardware, software and orgware aspects by:

1. strengthening standards for earthquake- and fire-proof construction
2. widening streets, building firebreaks, creating open and green spaces
3. building disaster-resistant city structures by land readjustment and urban renewal projects
4. promoting disaster prevention oriented careful urban renewal in cooperative projects of the machizukuri-type
5. improving public crisis management
6. promoting capacity building on neighbourhood level aiming at disaster prevention, emergency aid and post-disaster reconstruction

# Coping with Natural Disasters in Japanese Urban Planning

## 1. Introduction: The Big Earthquake Ahead – Lessons from Kôbe

### Obstacles towards implementing disaster prevention measures:

1. complicated ownership structures concerning land and buildings
2. land property divided into small plots
3. highly esteemed private land ownership and reluctance with regard to compulsory purchase for purposes of public utility
4. lack of financial resources and old age of many land owners
5. missing locational attraction for private developers
6. lack of public money to invest in infrastructure improvement and to give more incentives to private urban renewal

## 2. Damage Assessment and District-based Vulnerability in Tôkyô

### Assessment of Damages and Losses in Case of 3 Types of Earthquakes with Epicenters in Tôkyô Metropolitan Area

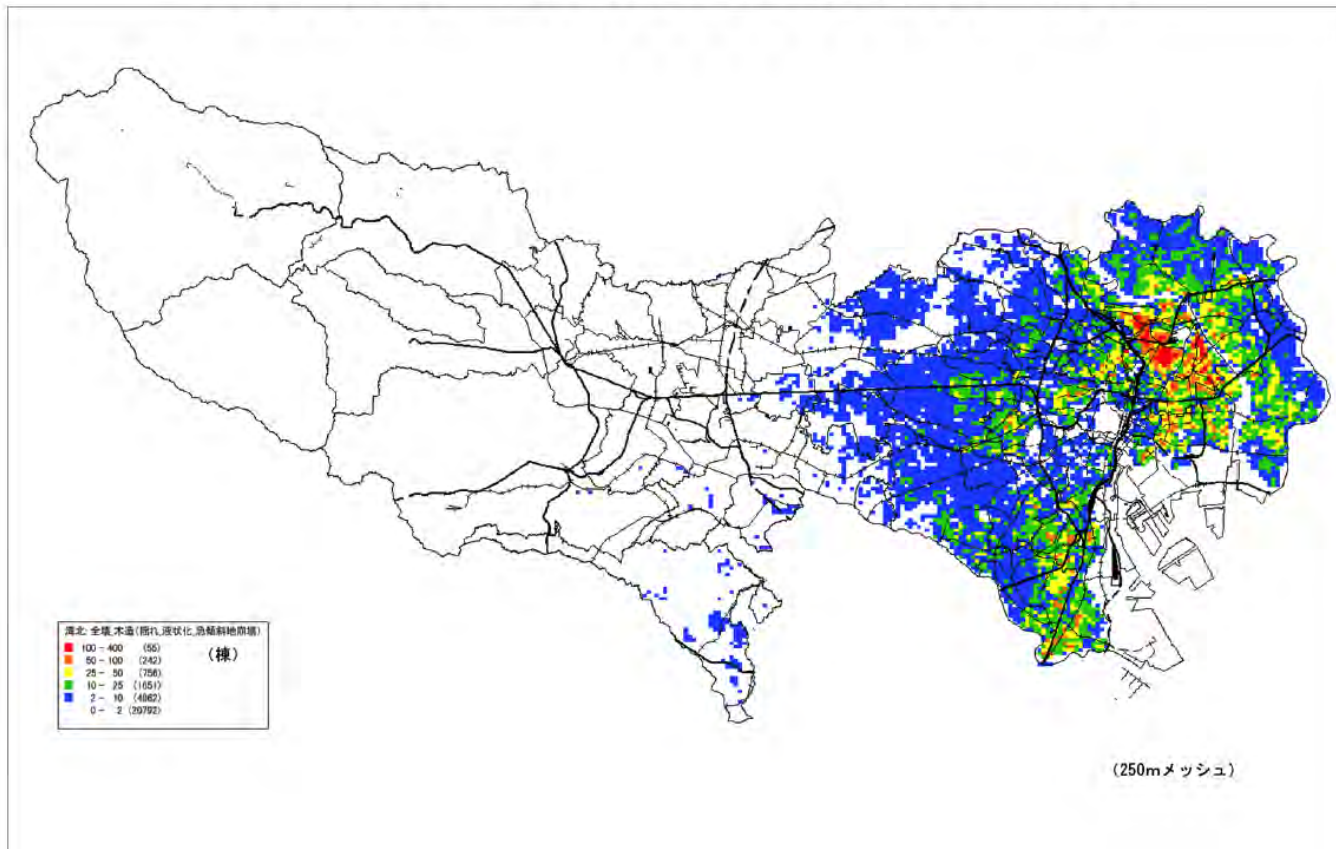
Epicenter	just beneath the capital		at deep-see trench	at active fault
	northern Tôkyô bay	Tama	Kantô-quake of Genroku-type	Tachikawa fault zone
Magnitude	M7.3	M7.3	M8.2	M7.4
Wind Velocity	8m/sec.			
Season/Time	winter/18:00			
<b>Deaths</b>	<b>9,700</b>	<b>4,700</b>	<b>5,900</b>	<b>2,600</b>
by earthquake	5,600	3,400	3,500	1,500
by fire	4,100	1,300	2,400	1,100
<b>Injured</b>	<b>147,600</b>	<b>101,100</b>	<b>108,300</b>	<b>31,700</b>
severely injured	(21,900)	(10,900)	(12,900)	(4,700)
by earthquake	129,000	96,500	98,500	27,800
by fire	17,700	4,600	9,800	3,900
<b>Buildings damaged</b>	<b>304,300</b>	<b>139,500</b>	<b>184,600</b>	<b>85,700</b>
by earthquake	116,200	75,700	76,500	35,400
by fire	188,100	63,800	108,100	50,300
<b>Evacuees</b> (Peak: After one day)	<b>3,390,000</b>	<b>2,760,000</b>	<b>3,200,000</b>	<b>1,010,000</b>
People experiencing trouble returning home	<b>5,170,000</b>			

Tôkyô-to bôσαι-kaigi (Disaster Prevention Council of TMG) (2012): Shuto chokka jishin nado ni yoru Tôkyô no higai sôtei hôkokusho. [http://www.bousai.metro.tokyo.jp/japanese/tmg/assumption\\_h24.html](http://www.bousai.metro.tokyo.jp/japanese/tmg/assumption_h24.html) (published: 18.04.2012; access: 21.04.2012)

## 2. Damage Assessment and District-based Vulnerability in Tôkyô

### Distribution of Totally Destroyed Wooden Buildings by Collapse in Case of an Earthquake in the Northern Part of Tôkyô Bay (M7.3)

東京湾北部地震における木造全壊建物棟数の分布（揺れ）

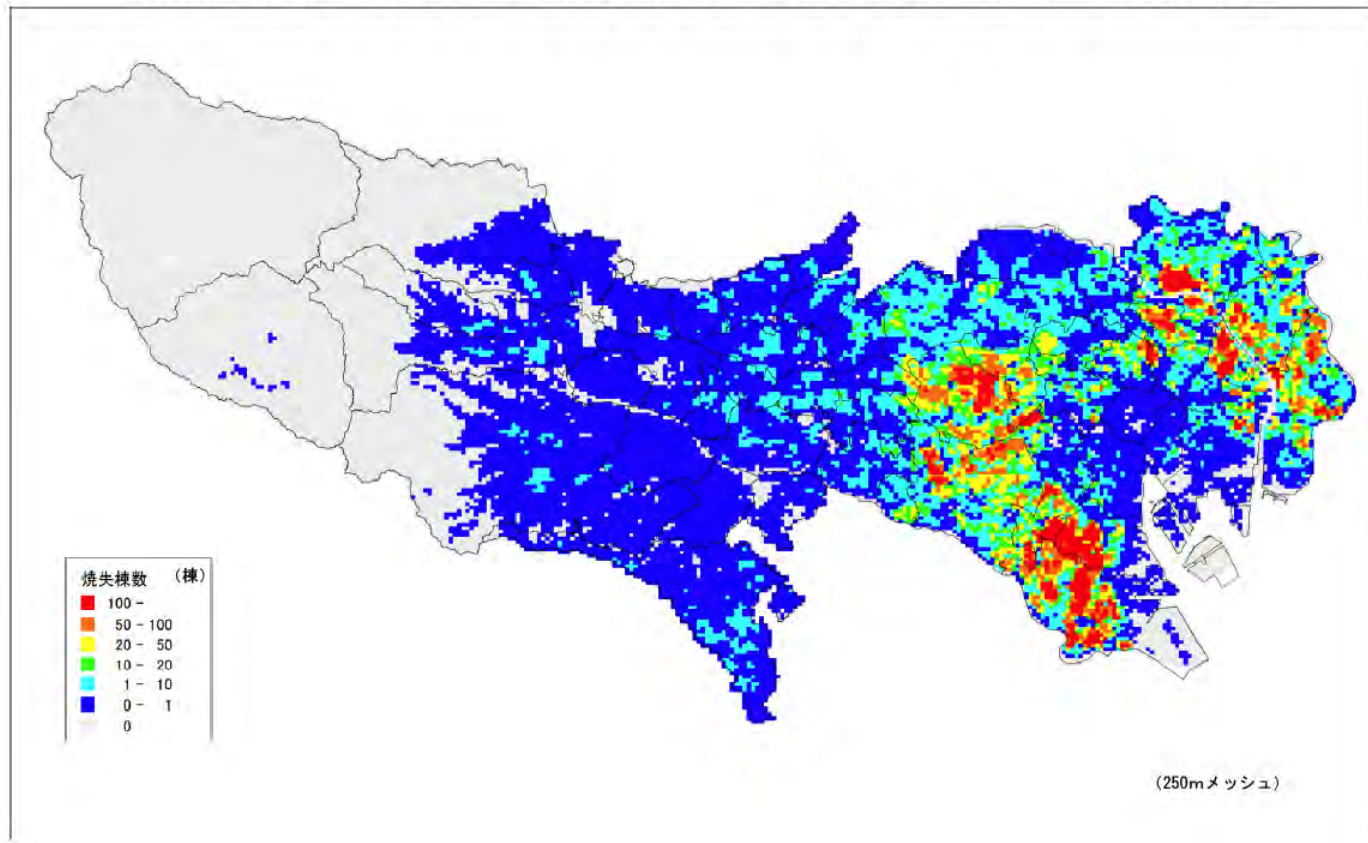


Tôkyô-to bôsei-kaigi  
(Disaster Prevention  
Council of TMG)  
(2012): Shuto chokka  
jishin nado ni yoru  
Tôkyô no higai sôtei  
hôkokusho.  
[http://www.bousai.metro.tokyo.jp/japanese/tmg/assumption\\_h24.html](http://www.bousai.metro.tokyo.jp/japanese/tmg/assumption_h24.html) (published:  
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21.04.2012)

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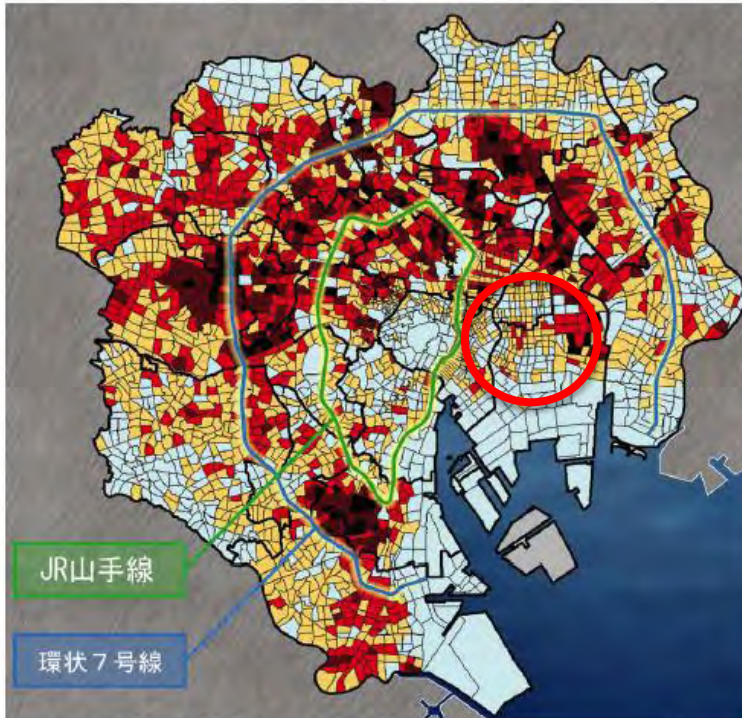
### Distribution of Totally Destroyed Wooden Buildings by Fire in Case of an Earthquake in the Northern Part of Tôkyô Bay (M7.3)

東京湾北部地震における焼失棟数分布（冬 18時 風速 8m/s）（火災）

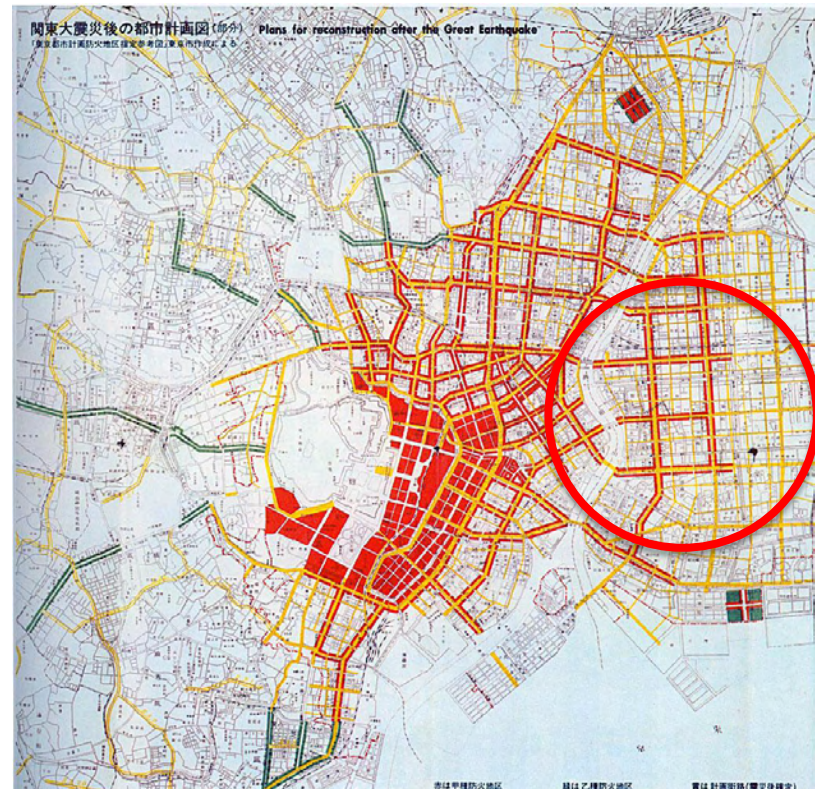
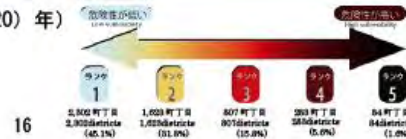


Tôkyô-to bô sai-kaigi  
(Disaster Prevention Council of TMG)  
(2012): Shuto chokka  
jishin nado ni yoru  
Tôkyô no higai sôtei  
hôkokusho.  
[http://www.bousai.metro.tokyo.jp/japanese/tmg/assumption\\_h24.html](http://www.bousai.metro.tokyo.jp/japanese/tmg/assumption_h24.html) (published: 18.04.2012; access: 21.04.2012)

## 2. Damage Assessment and District-based Vulnerability in Tôkyô District-based Vulnerability to Fire in the 23 Wards of Tôkyô 2012 and Effects of Disaster-proof Reconstruction after Kantô Earthquake 1923



第6回地域危険度調査 (2008 (平成 20) 年)  
における火災危険度ランク図

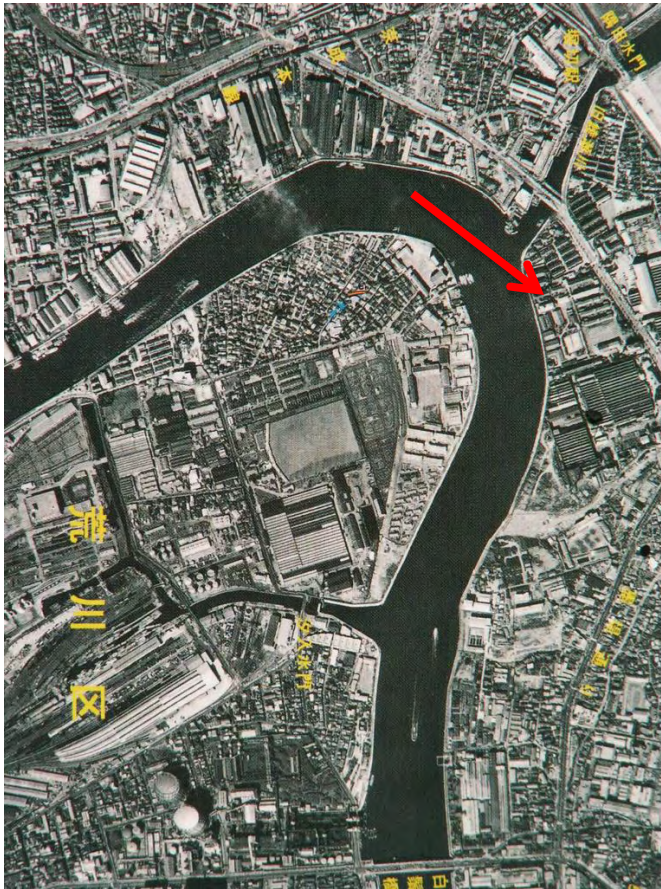


Masai, Yasuo (1986): Atlas Tôkyô. Tôkyô, p. 31.

Tôkyô-to (2012): 'Mokumitsu-chiiki funenka 10 nen purojekuto' jissai hôshin (Implementation principles of the '10 years project to make high density wooden housing areas fire-resistant'). Tôkyô, p. 16.

## 3. Earthquake-related Disaster Prevention Planning and its Development Path after the Second World War

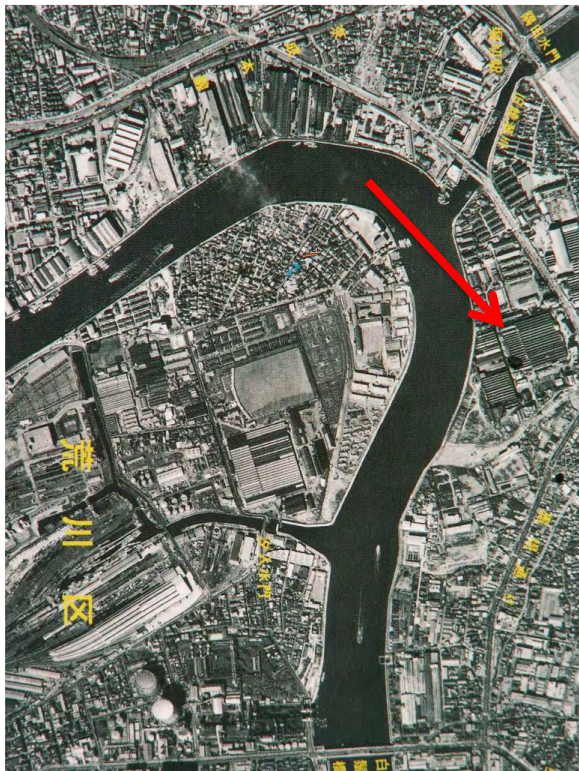
### Concept of Disaster Prevention Bases in Kôto Delta 1969



[http://www.toshiseibi.metro.tokyo.jp/saikaihatu\\_j/tikubetu/shahige\\_higashi/index.html](http://www.toshiseibi.metro.tokyo.jp/saikaihatu_j/tikubetu/shahige_higashi/index.html); access: 28.04.12

## 3. Earthquake-related Disaster Prevention Planning and its Development Path after the Second World War

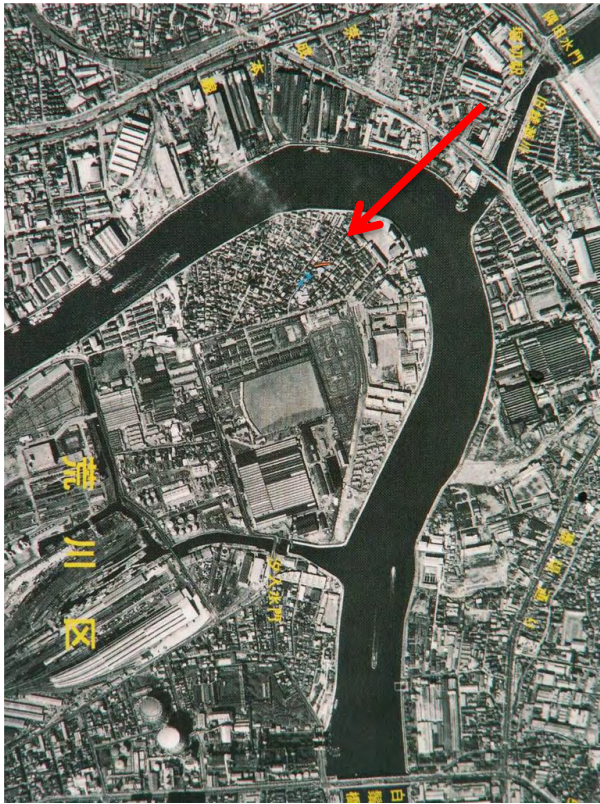
### Disaster Prevention Base Shirahige East in Kôtô Delta



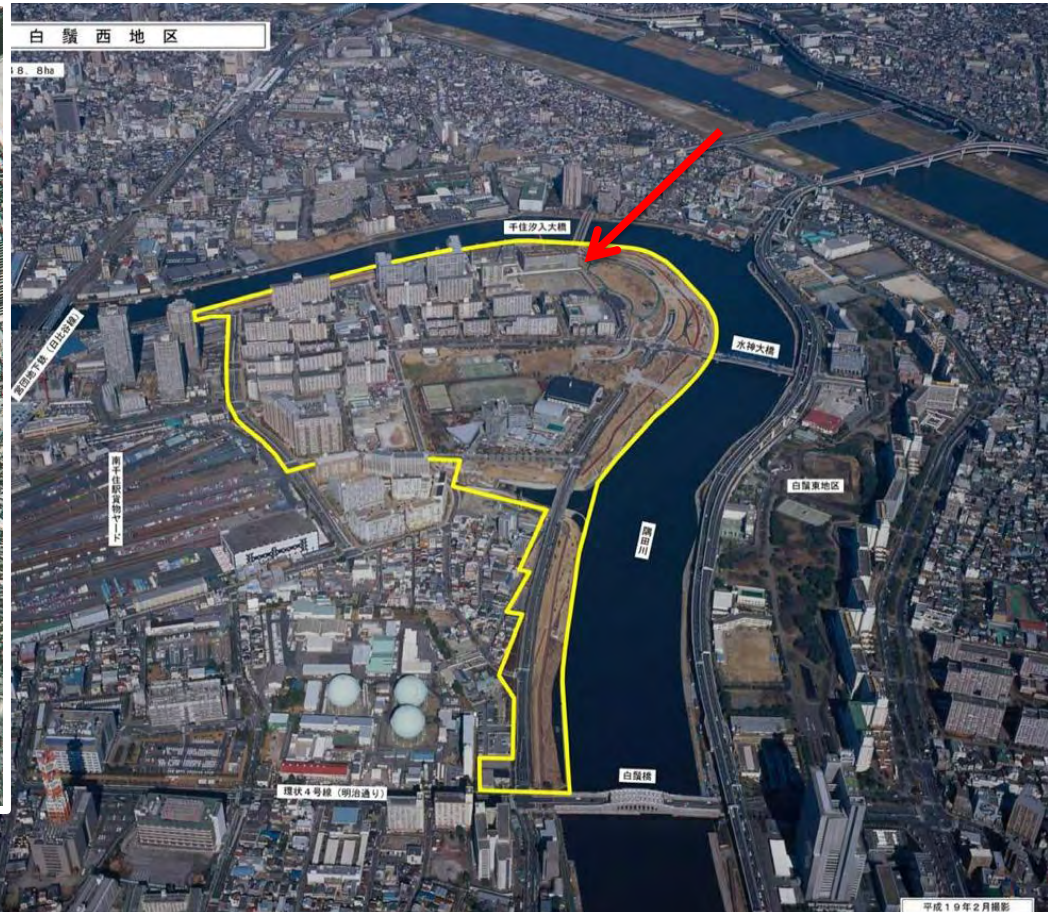
[http://www.toshiseibi.metro.tokyo.jp/saikaihatu\\_j/tikubetu/shahige\\_higashi/index.html](http://www.toshiseibi.metro.tokyo.jp/saikaihatu_j/tikubetu/shahige_higashi/index.html); 28.04.12

## 3. Earthquake-related Disaster Prevention Planning and its Development Path after the Second World War

### Disaster Prevention Base Shirahige West in Kôto Delta



[http://www.toshiseibi.metro.tokyo.jp/saikai/hatu\\_j/tikubetu/shirahige\\_nishi/images/01L.jpg](http://www.toshiseibi.metro.tokyo.jp/saikai/hatu_j/tikubetu/shirahige_nishi/images/01L.jpg); 28.04.12



## 3. Earthquake-related Disaster Prevention Planning and its Development Path after the Second World War

### Designated Evacuation Areas in 23 Wards (2002)

Map of Safety Evacuation Area in 23wards



TMG (2002): Anata no machi no chiiki kikendo. Tōkyō, p. 14.



# Coping with Natural Disasters in Japanese Urban Planning

## 3. Earthquake-related Disaster Prevention Planning and its Development Path after the Second World War

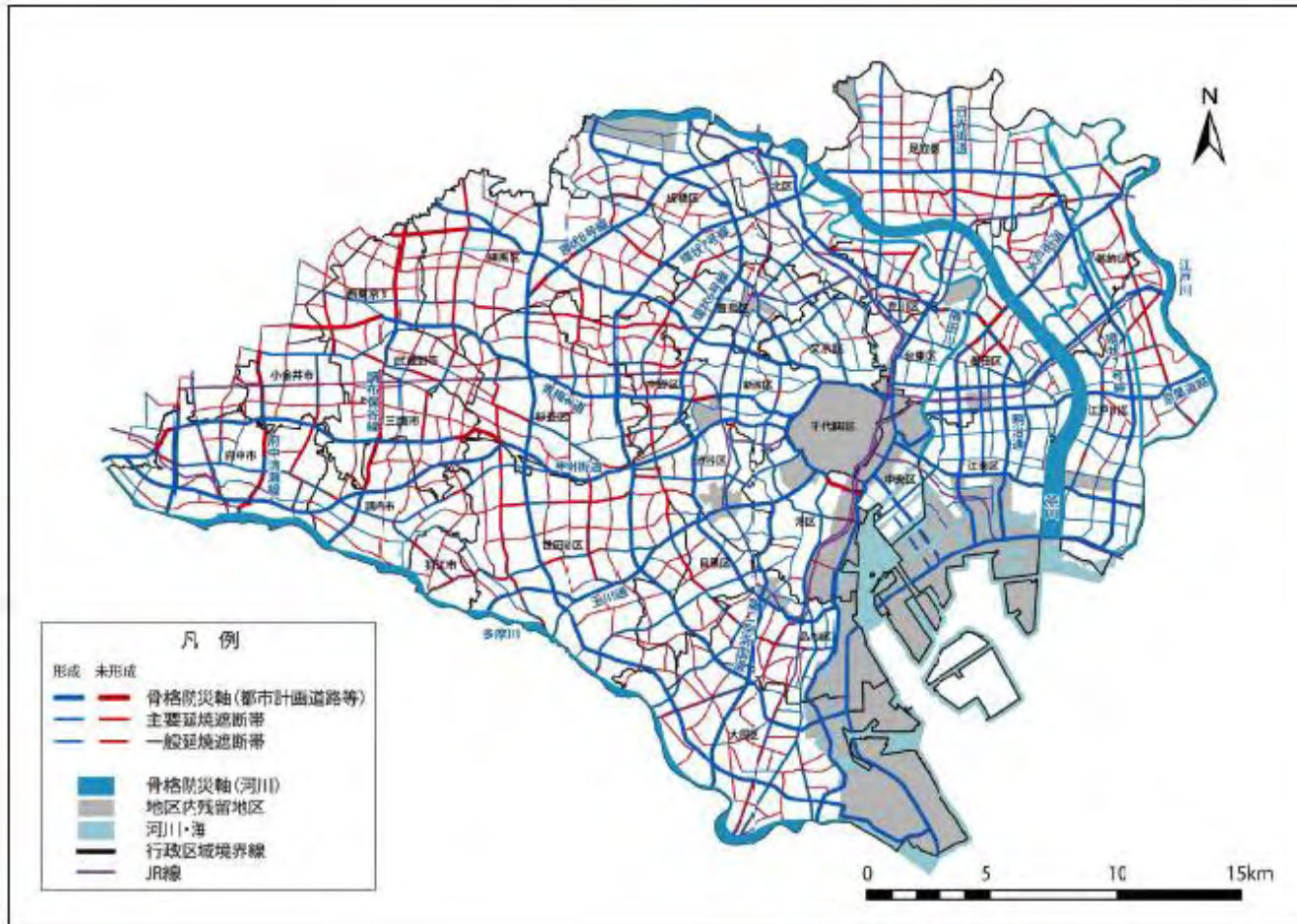
### Concept of Firebreaks and Disaster-proof Living Zones



Tôkyô-to (2010): Bôsai toshizukuri suishin keikaku (Plan to Promote Urban Planning aimed at Disaster Prevention). Tôkyô, p. 12.

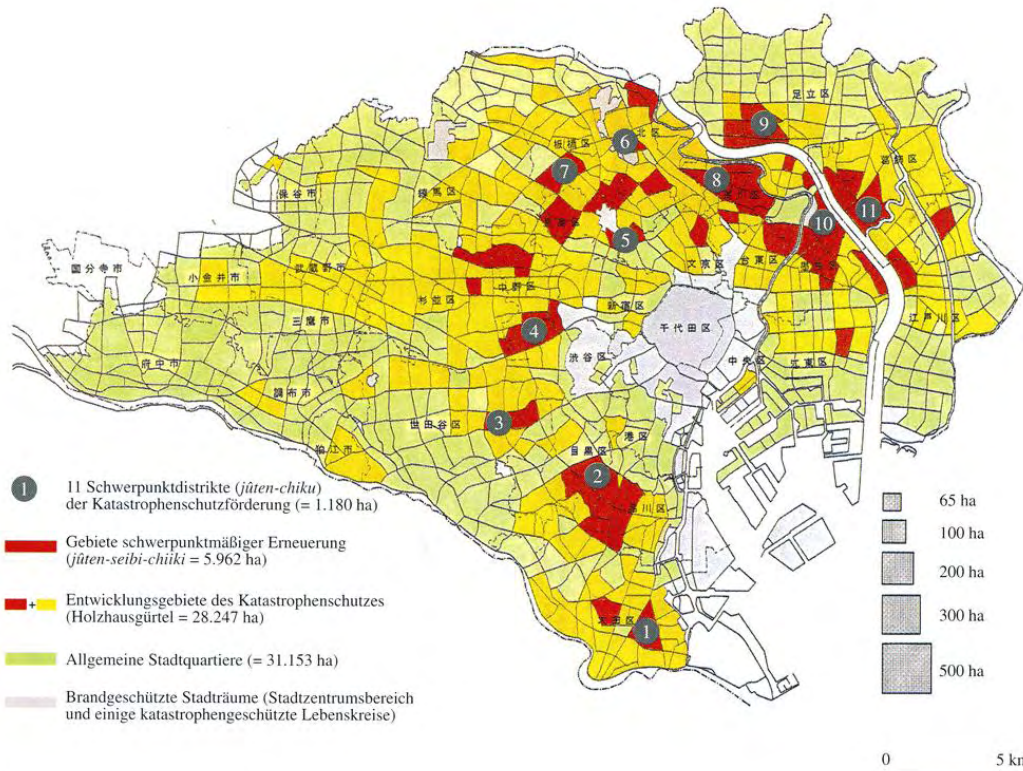
## 3. Earthquake-related Disaster Prevention Planning and its Development Path after the Second World War

### Concept of Disaster-proof Living Zones Surrounded by Firebreaks



Tōkyō-to (2010): Bōsai toshizukuri suishin keikaku (Plan to Promote Urban Planning aimed at Disaster Prevention). Tōkyō, p. 173.

## 4. Striving for Better Disaster Prevention in the Belt of Densely Built-up Wooden Houses in Tôkyô



### Schwerpunktdistrikte der Katastrophenschutzförderung:

- |  |  |
|--|--|
| 1 Ômori-Naka   | 6 Jûjô   |
| 2 Umfeld von Rinshi no Mori (Ebara-Kita und Meguro-Honchô) | 7 Ôyaguchi                                     |
| 3 Umfeld des Rathauses von Setagaya-ku                     | 8 Machiya und Ogu                              |
| 4 Nakano-Minamidai   | 9 Distrikt westlich des Bahnhofs von Nishiarai |
| 5 Higashi-Ikebukuro  | 10 Umgebung von Kanegafuchi                    |
|  | 11 Tateishi und Yotsugi                        |

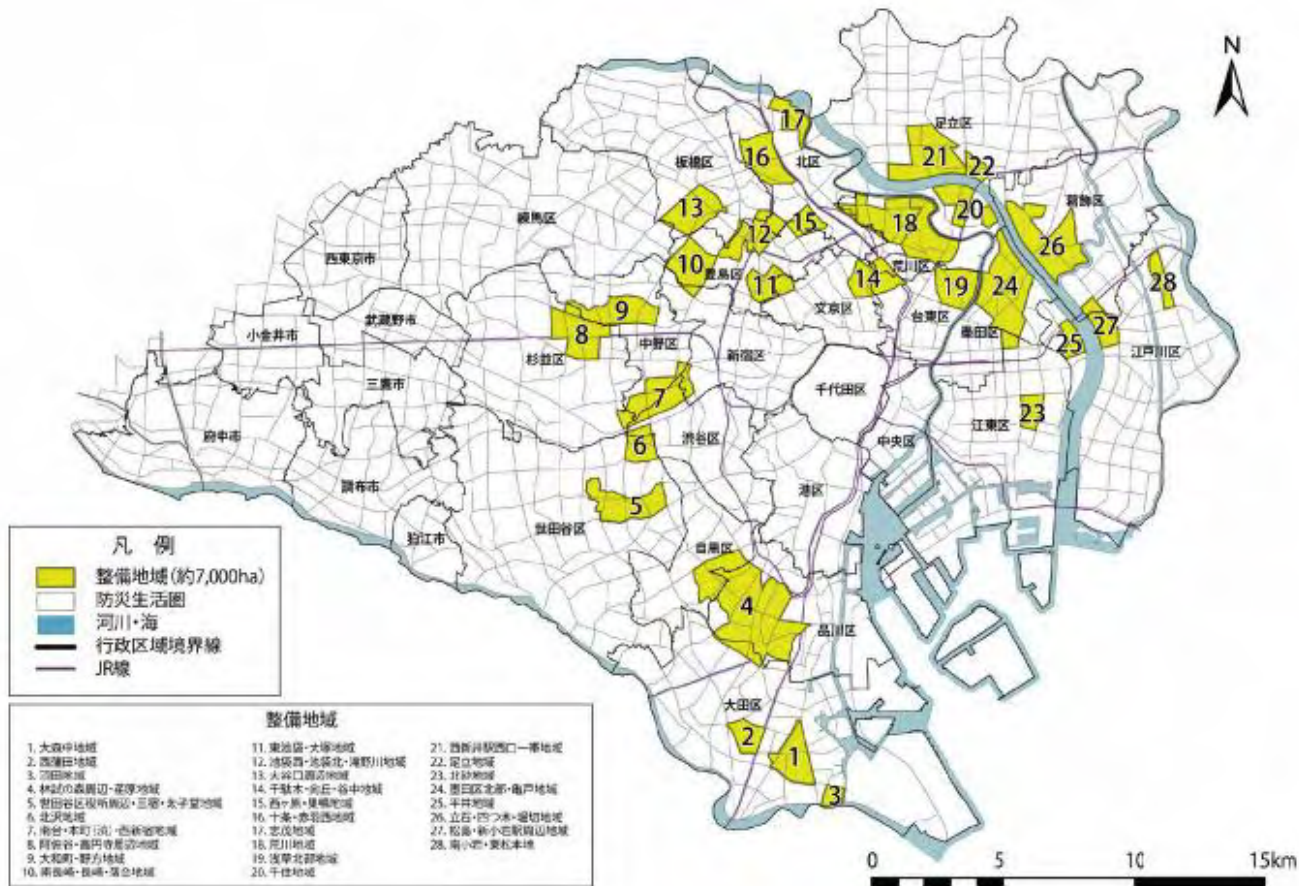
Tôkyô-to (1997): Bôsai-toshizukuri suishin-keikaku 1996, p. 8.

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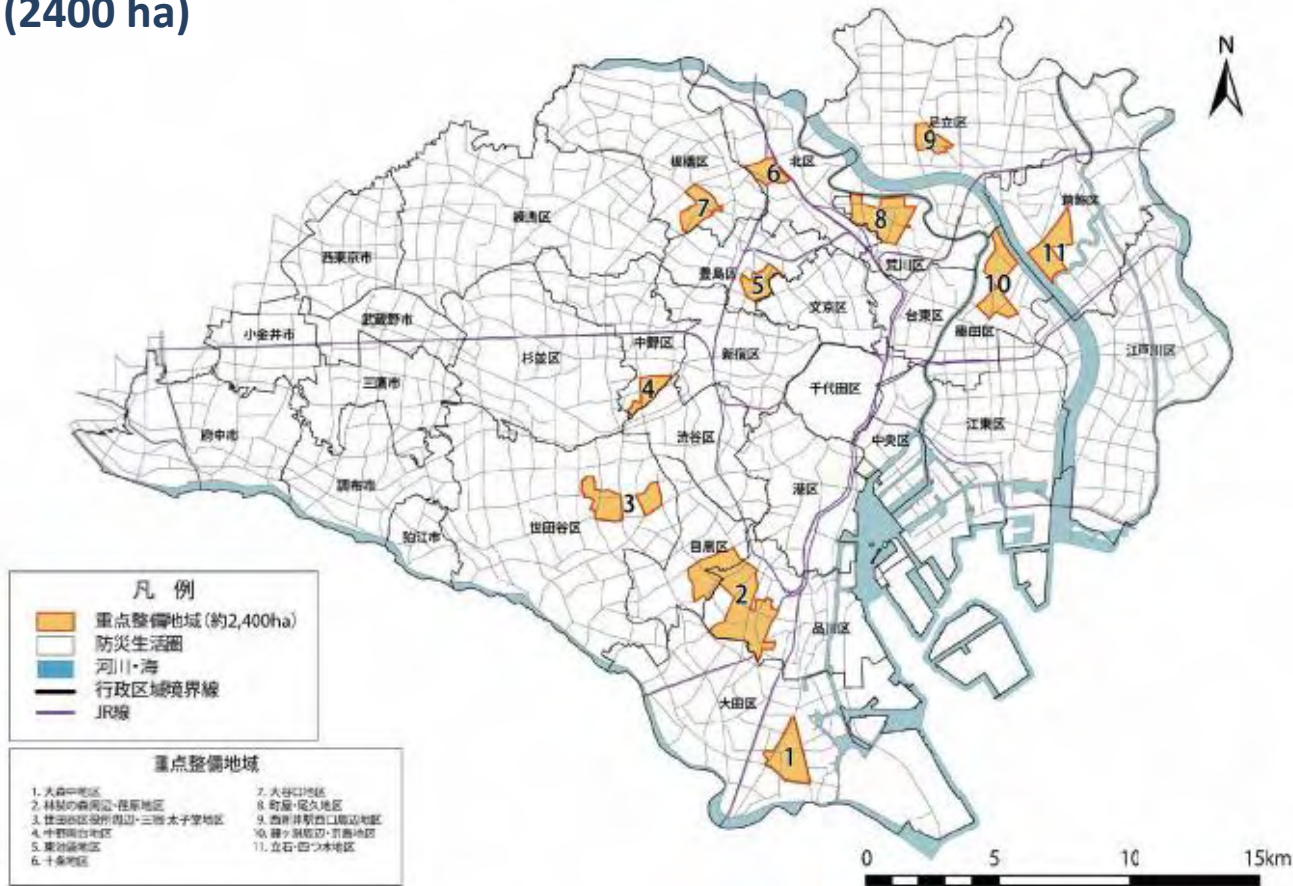
28 Designated Improvement Districts of Disaster Prevention 2010 (7000 ha, 1.8 Mio. Inhabitants)



Tôkyô-to (2010): Bôσαι-toshizukuri suishin-keikaku. Revision January 2010, p. 9.

## 4. Striving for Better Disaster Prevention in the Belt of Densely Built-up Wooden Houses in Tôkyô

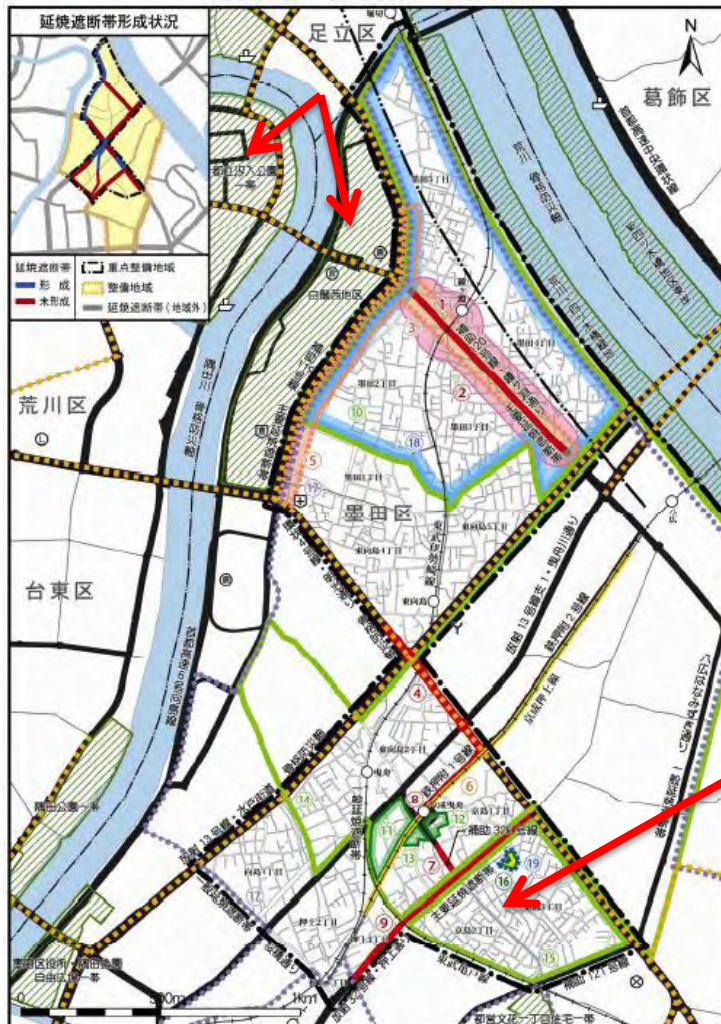
### 11 Designated Priority Improvement Districts of Disaster Prevention 2010 (2400 ha)



Tôkyô-to (2010): Bousai-toshizukuri suishin-keikaku. Revision January 2010, p. 10.

## 4. Striving for Better Disaster Prevention in the Belt of Densely Built-up Wooden Houses in Tôkyô

Designated Priority Improvement District No. 10: Kanegafuchi and Kyôjima (218 ha, 51,900 Inhabitants)



Tôkyô-to (2010): Bôsai toshizukuri suishin keikaku (Disaster-resistant City Development Promotion Plan). Tôkyô, p. 125, 126.

# Coping with Natural Disasters in Japanese Urban Planning

## 4. Striving for Better Disaster Prevention in the Belt of Densely Built-up Wooden Houses in Tôkyô

### Impressions from Kyôjima



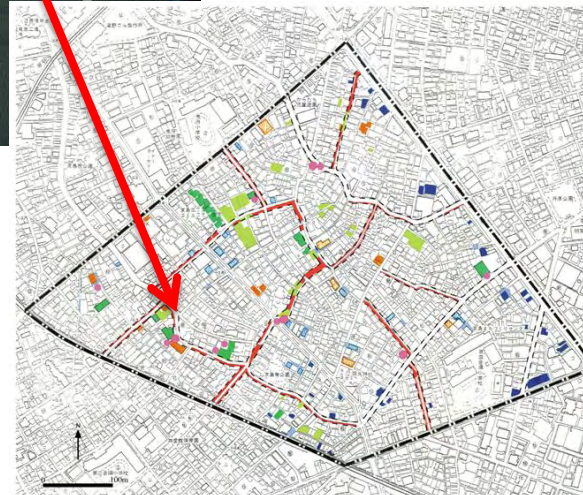
## 4. Striving for Better Disaster Prevention in the Belt of Densely Built-up Wooden Houses in Tôkyô

### Machizukuri in Kyôjima



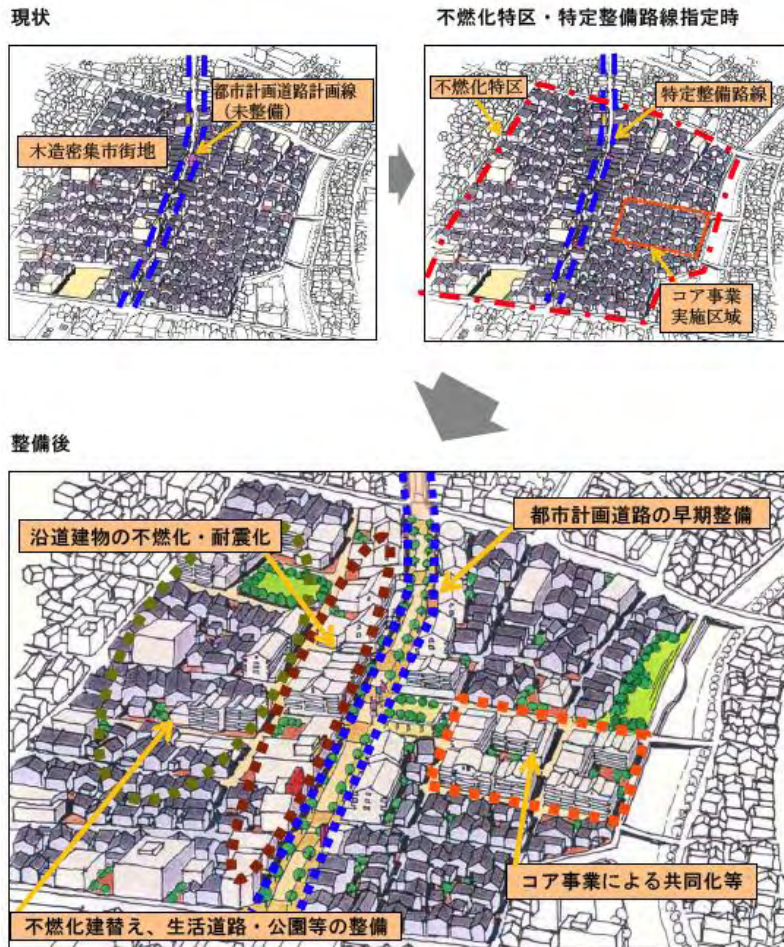
## 4. Striving for Better Disaster Prevention in the Belt of Densely Built-up Wooden Houses in Tôkyô

### Machizukuri Model Project in Kyôjima: „Living Street“ (seikatsu dôro)



- 01.97 Machizukuri-Unterstützungssystem (Basis: Nachbarschaftsplan)
- 01.97 Maßnahme zur umfassenden Erneuerung von Distrikten mit Mietwohnungen in Holzbauweise
- 09.95 Subventionssystem zum Bau empfehlenswerter brandschutzfähiger Wohnungen im Stadtquartier
- 09.95 Subventionssystem zur Förderung des Baus brandschutzfähiger Gebäude plus Subventionssystem zur Förderung des städtischen Katastrophen- und Brandschutzes
- 01.97 Community-Wohnungen
- 01.97 Grundstück für Machizukuri-Projekte
- 09.95 ausgewiesene Lebens(raum)straßen
- 09.95 noch zu verbreiternde Abschnitte von Lebens(raum)straßen
- 09.95 abgeschlossene Verbesserungsmaßnahmen an schmalen Straßen
- Pocketpark
- Regenwasserspeicher

## 4. Striving for Better Disaster Prevention in the Belt of Densely Built-up Wooden Houses in Tôkyô



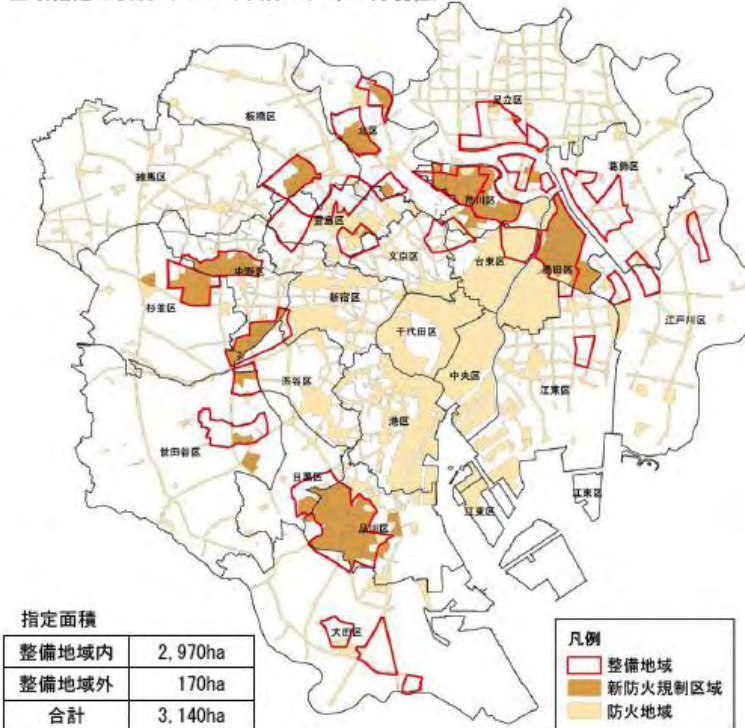
Concept of „Specified Districts for Fire-Resistance Promotion“ (funenka tokku)

Tôkyô-to (2012): ‚Mokumitsu-chiiki funenka 10 nen purojekuto‘ jissai hôshin (Implementation principles of the ‚10 years project to make high density wooden housing areas fire-resistant‘). Tôkyô, p. 14.

## 4. Striving for Better Disaster Prevention in the Belt of Densely Built-up Wooden Houses in Tôkyô



区域指定の状況 (2012 (平成 24) 年 1 月現在)

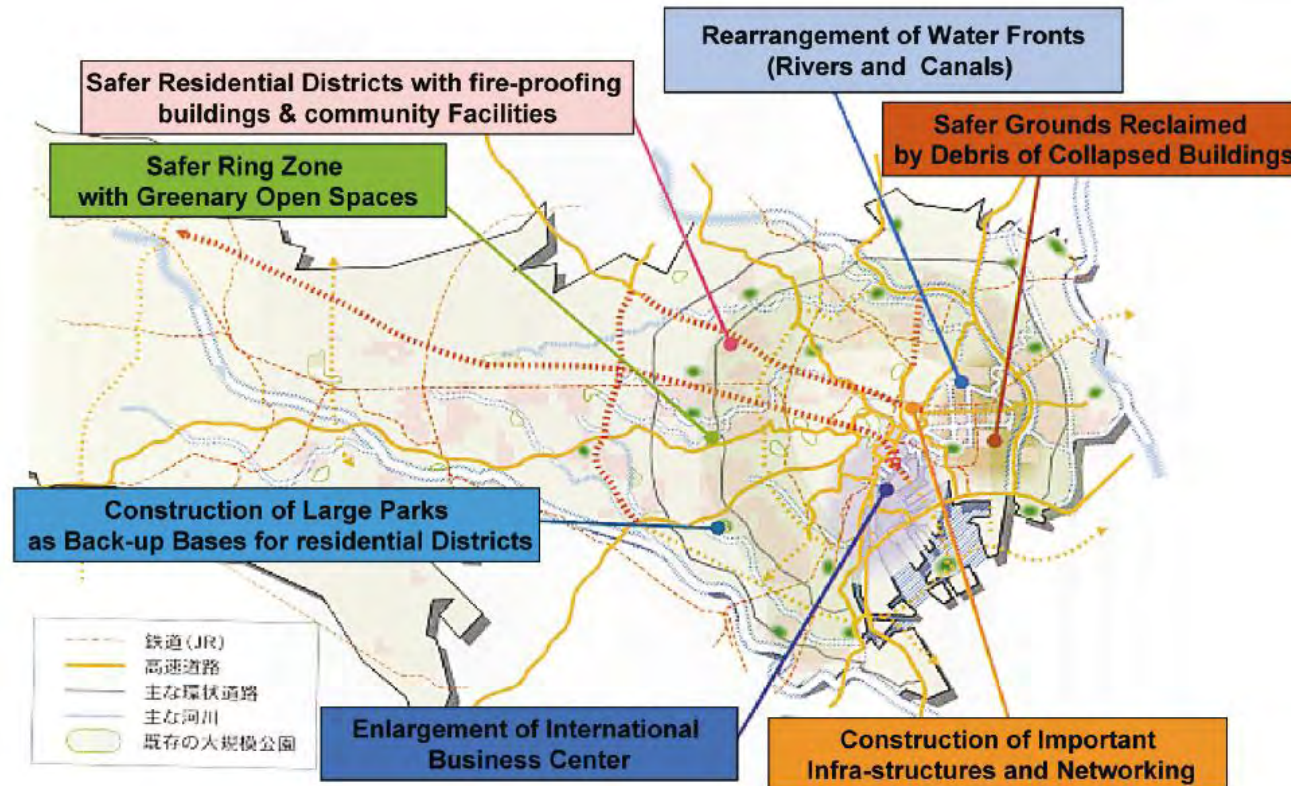


### Designated Zones with New Regulations for Fire-Resistance of Buildings 2012 (3140 ha)

Tôkyô-to (2012): ,Mokumitsu-chiiki funenka 10 nen purojekuto' jissai hôshin (Implementation principles of the ,10 years project to make high density wooden housing areas fire-resistant').Tôkyô, p. 20.

## 5. Conclusion: Tôkyô on its Way Towards a Disaster Resilient City

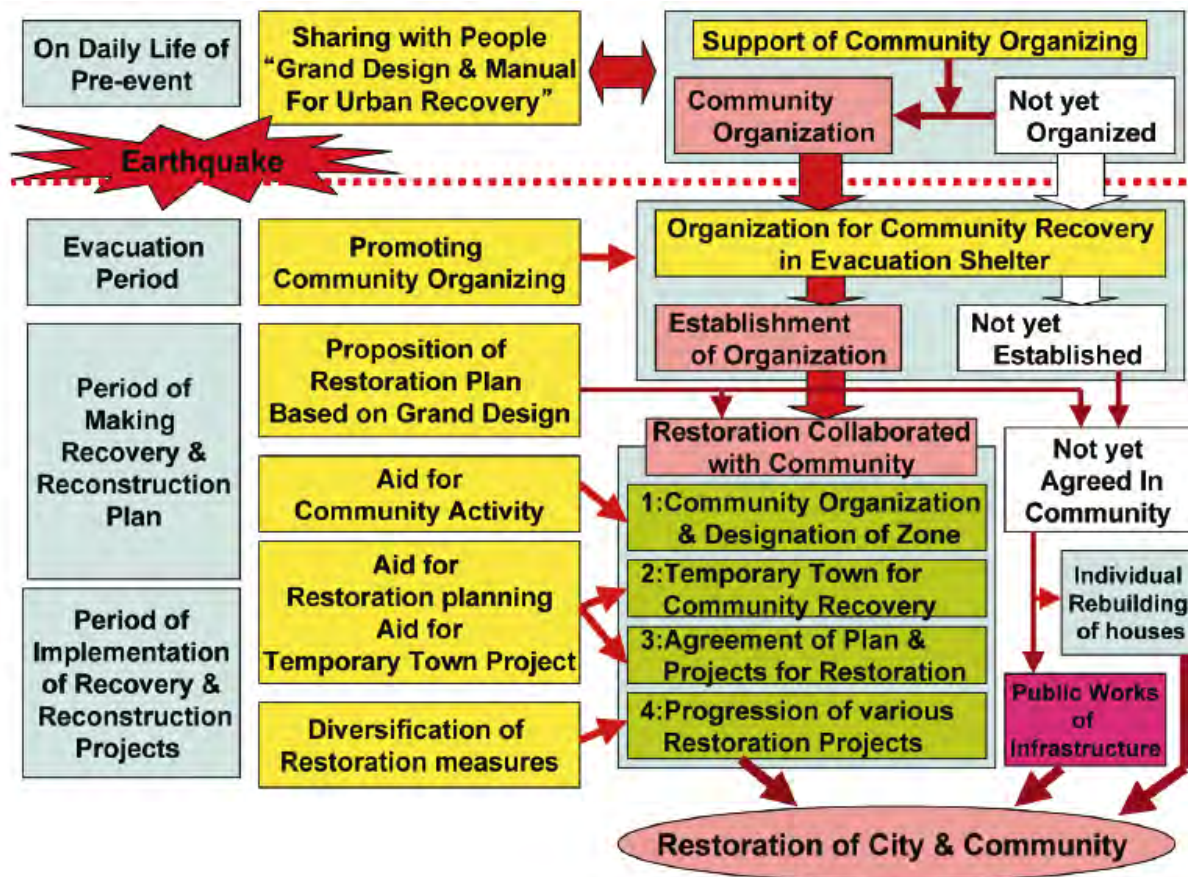
### Strategic Concepts of Urban Reconstruction after TMG „Grand Design for Post-Earthquake Reconstruction“



Nakabayashi, I., Aiba, S. and Ichiko, T. (2008): Pre-Disaster Restoration Measure of Preparedness for Post-Disaster Restoration in Tokyo. In: Journal of Disaster Research, Vol. 3, No. 6, p. 418.

## 5. Conclusion: Tôkyô on its Way Towards a Disaster Resilient City

### Concept of Community Based Recovery According to the „Manual of Post-Earthquake Reconstruction“ of TMG



Nakabayashi, I., Aiba, S. and Ichiko, T. (2008): Pre-Disaster Restoration Measure of Preparedness for Post-Disaster Restoration in Tokyo. In: Journal of Disaster Research, Vol. 3, No. 6, p. 412.

## 5. Conclusion: Tôkyô on its Way Towards a Disaster Resilient City

**Promoting a holistic approach in disaster prevention by integrating**

- 1. hardware, software and orgware**
- 2. know-how, activities and financial resources of communities, public and private sector**
- 3. capacity building by education and training for citizens and experts**
- 4. preventative, emergency and pre-disaster reconstruction planning**
- 5. toshikeikaku and machizukuri**
- 6. different levels of scale and hierarchies**

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