

A Railway Operator's Perspective
on the Lessons of
the Great Hanshin-Awaji Earthquake

WEST JAPAN RAILWAY COMPANY

Takayuki Sasaki

Introduction

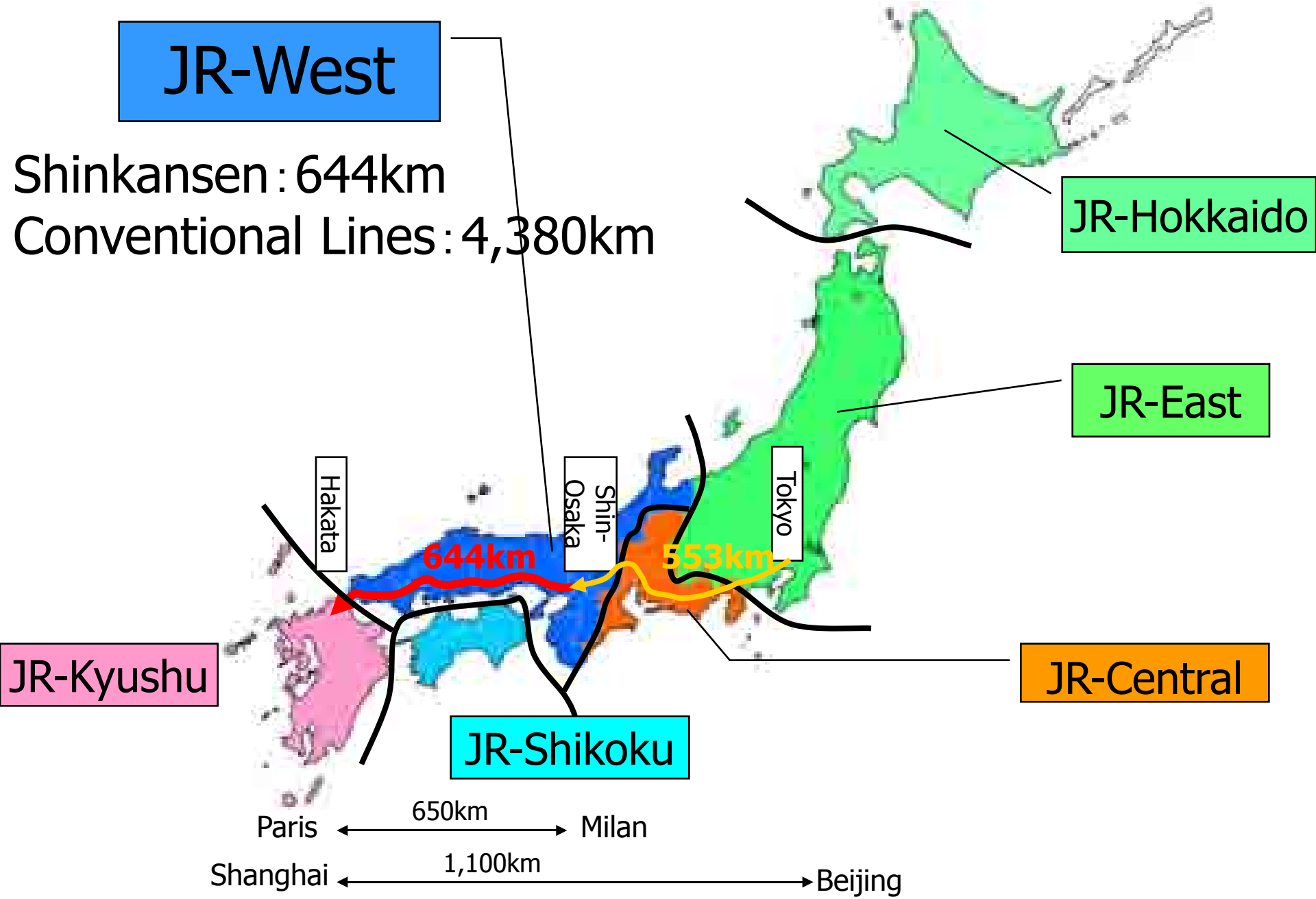
Welcome to Kyoto!

➤ Outline of JR-West

JR West Service Area

JR-West

Shinkansen: 644km
Conventional Lines: 4,380km



JR-Hokkaido

JR-East

JR-Central

JR-Shikoku

JR-Kyushu

Paris ← 650km → Milan

Shanghai ← 1,100km → Beijing

JR-West Railway Network



Seismic Damage Status (DVD Pictures)

- Appearance of earthquake
- Appearance of quake-hit area immediately after earthquake
- Recovery work

Help from the Global Community and Local Citizens' Own Efforts

- Aid from 30 countries
- Composed behavior of citizens in the affected area

The Great Hanshin-Awaji Earthquake

- Time and date of occurrence :
January 17 (Tue), 1995 5:46 a.m.
- Seismic Intensity: “7”
(Maximum seismic intensity until then had been 6.)

About the Kansai Region

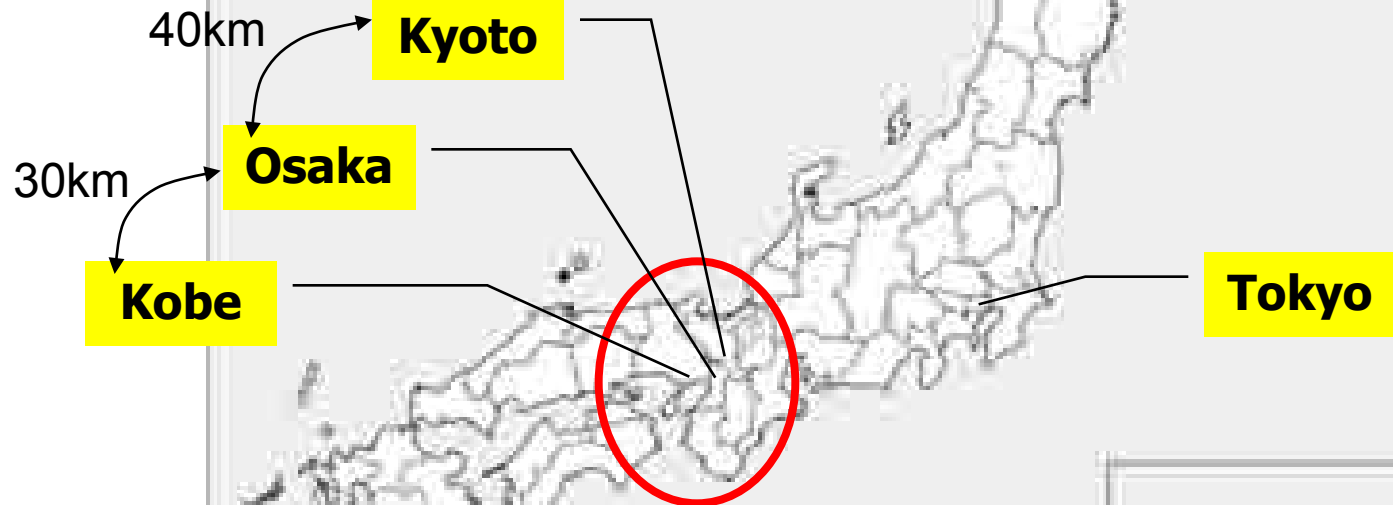
<Population>

Osaka-city: 2.7 million

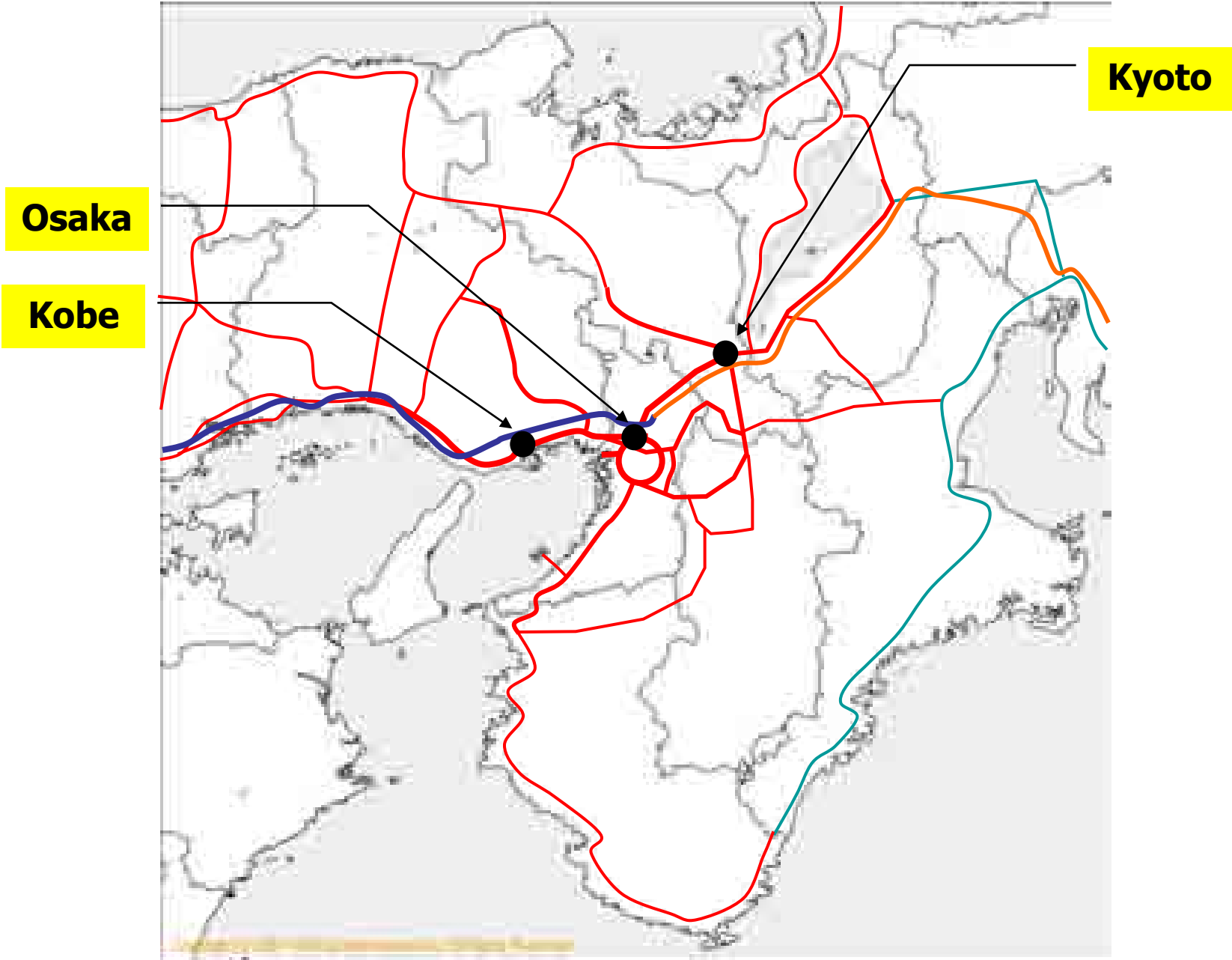
Kobe-city: 1.5 million

Kyoto-city: 1.5 million

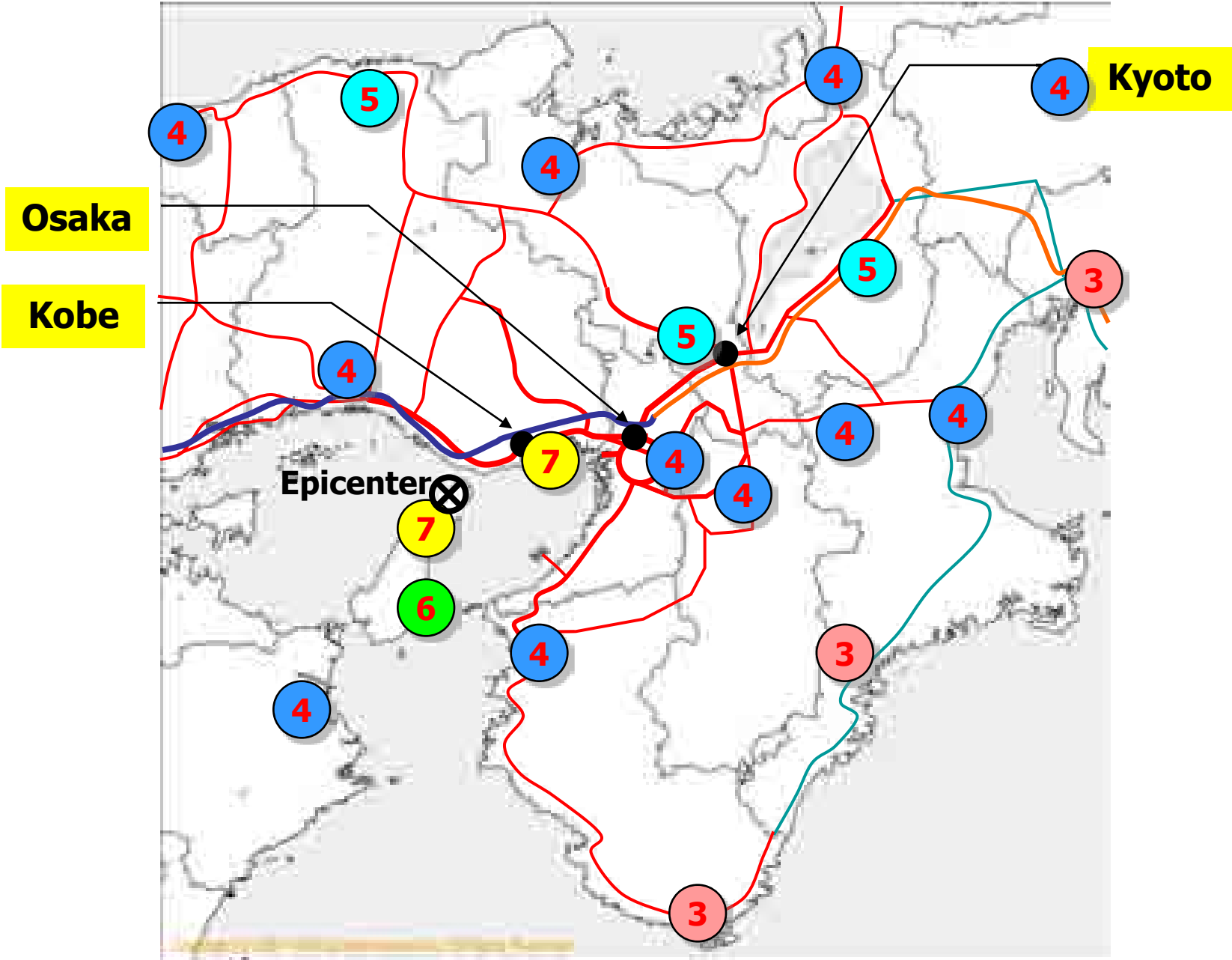
**Kyoto-Osaka-Kobe Commuting Area
: approx. 20 million**



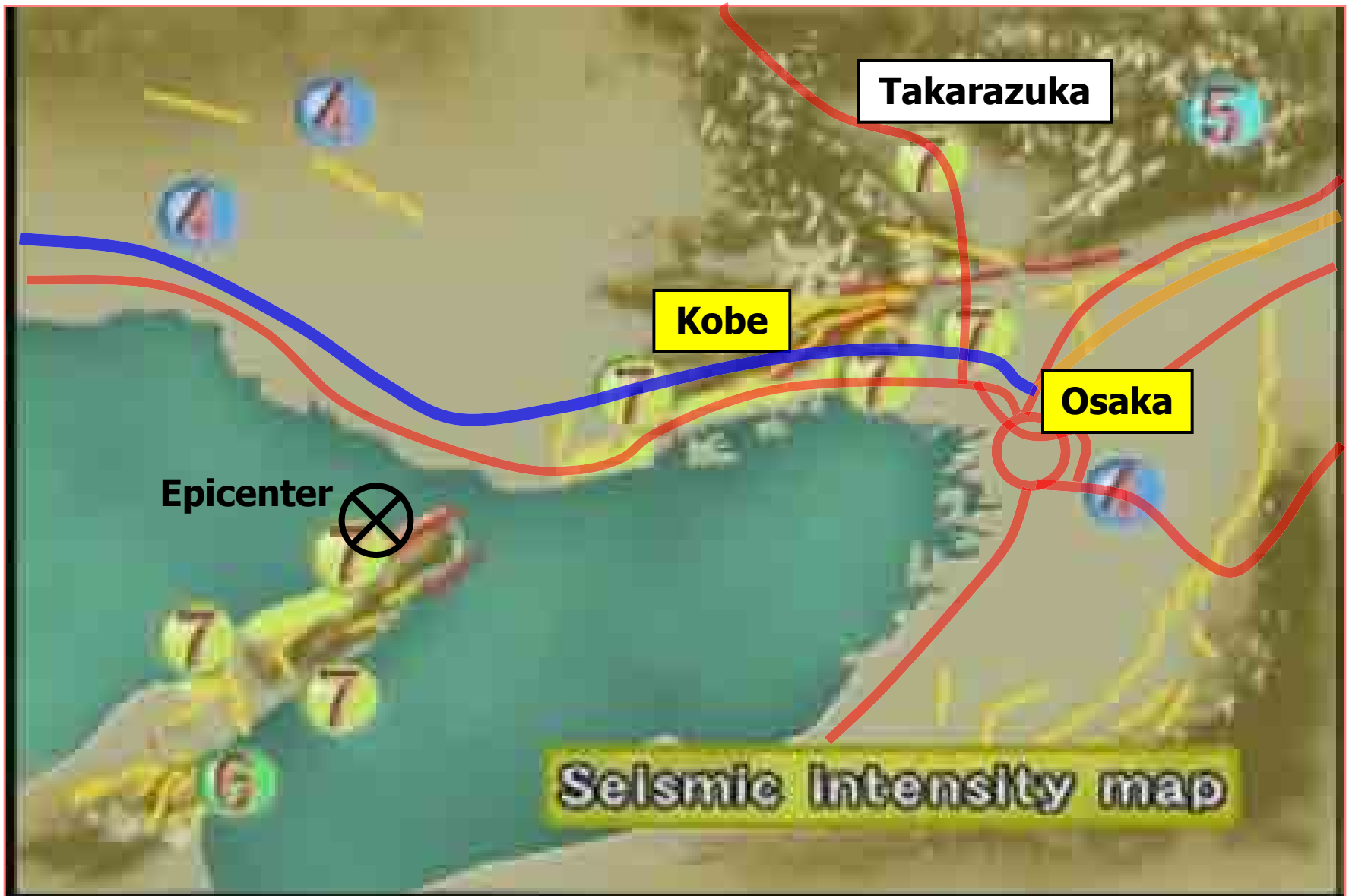
JR-West Railway Network (Kansai Area)



Damage Situation at JR-West



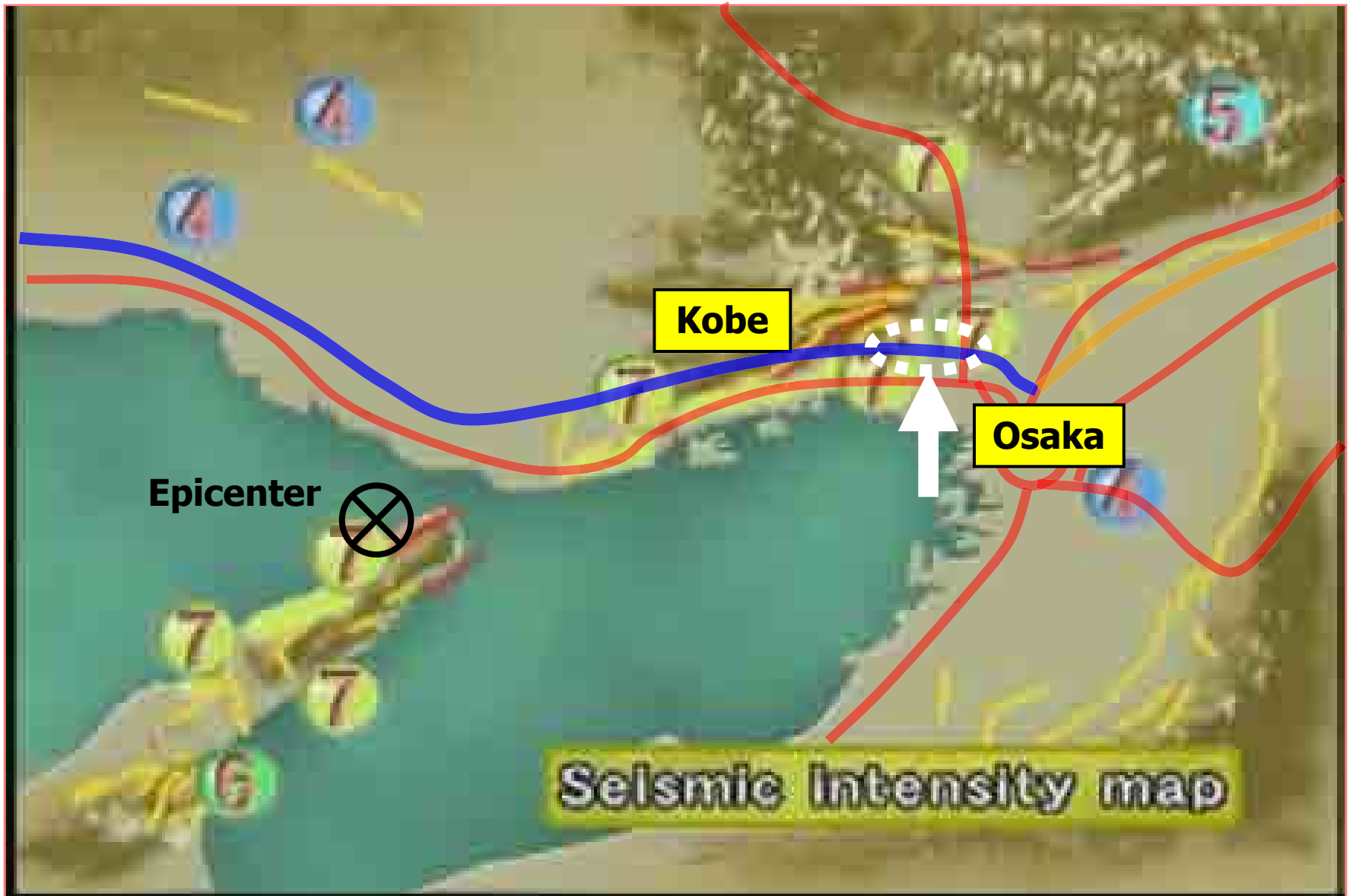
Disaster Area and Seismic Intensity



Damage Overview

- Deaths: 6,433
- Completely and semi-destroyed homes:
Approx. 250,000 houses (460,000 households)
- Estimated cost of damage:
Approx. \ 10 Trillion
(Worst damage since World War II in Japan)

Damage Situation at JR-West (Shinkansen)



Damage Situation ① (Shinkansen)



Damage Situation ② (Shinkansen)



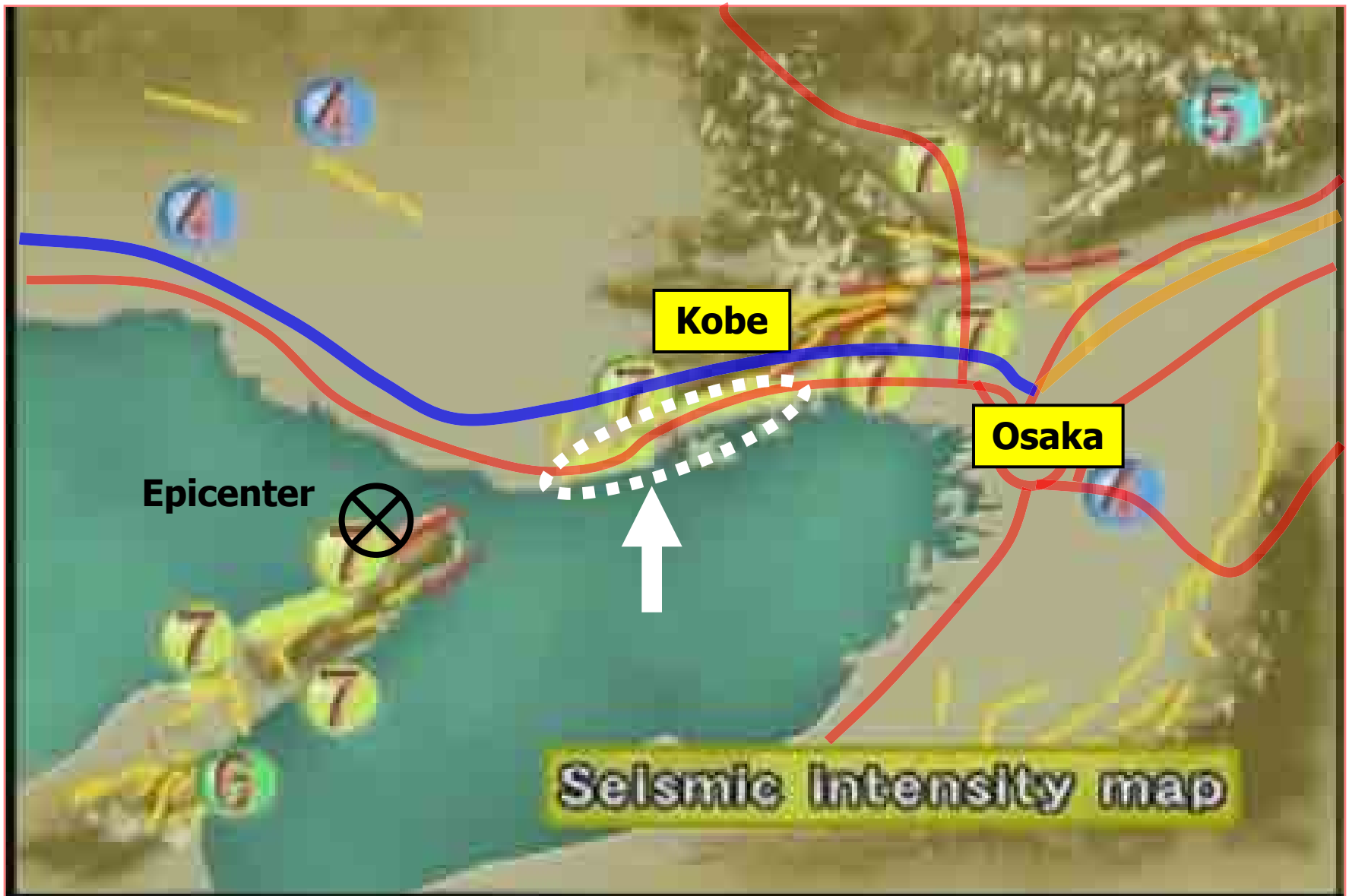
Damage Situation ③ (Shinkansen)



Damage Situation ④ (Shinkansen)



Damage Situation at JR-West (Conventional Lines)



Damage Situation ⑤ (Conventional Lines)



Takatori Depot

Damage Situation ⑥ (Conventional Lines)



Around Takatori Station

Damage Situation ⑦ (Conventional Lines)

20



Shin-Nagata Station

Damage Situation ⑧ (Conventional Lines)



Shin-Nagata Station
closed by fire



Damage Situation ⑨ (Conventional Lines)



Around Rokkomichi

Damage Situation ⑩ (Conventional Lines)



Around Rokkomichi

Damage Situation ⑪ (Conventional Lines)



Rokkomichi Station
completely destroyed

Damage Situation ⑫ (Conventional Lines)



Ashiya Station

Unexpected Damage

- Hardly any recognition that a major earthquake could occur in the Kansai region
- Collapse of solidly constructed elevated concrete bridges

Events leading up to Restoration of Services

- Establishment of **Recovery System Headquarters** to unify power and authority
- **"Spirit of the Railways"**
(DNA of 130 years of history)

Civil Engineering Work: Bridge Beam Reuse



Civil Engineering Work: Bridge Beam Reuse

- Bridge beam raised by jack for reuse



Civil Engineering Work: Bridge Beam Reuse

➤ Collapsed bridge pier



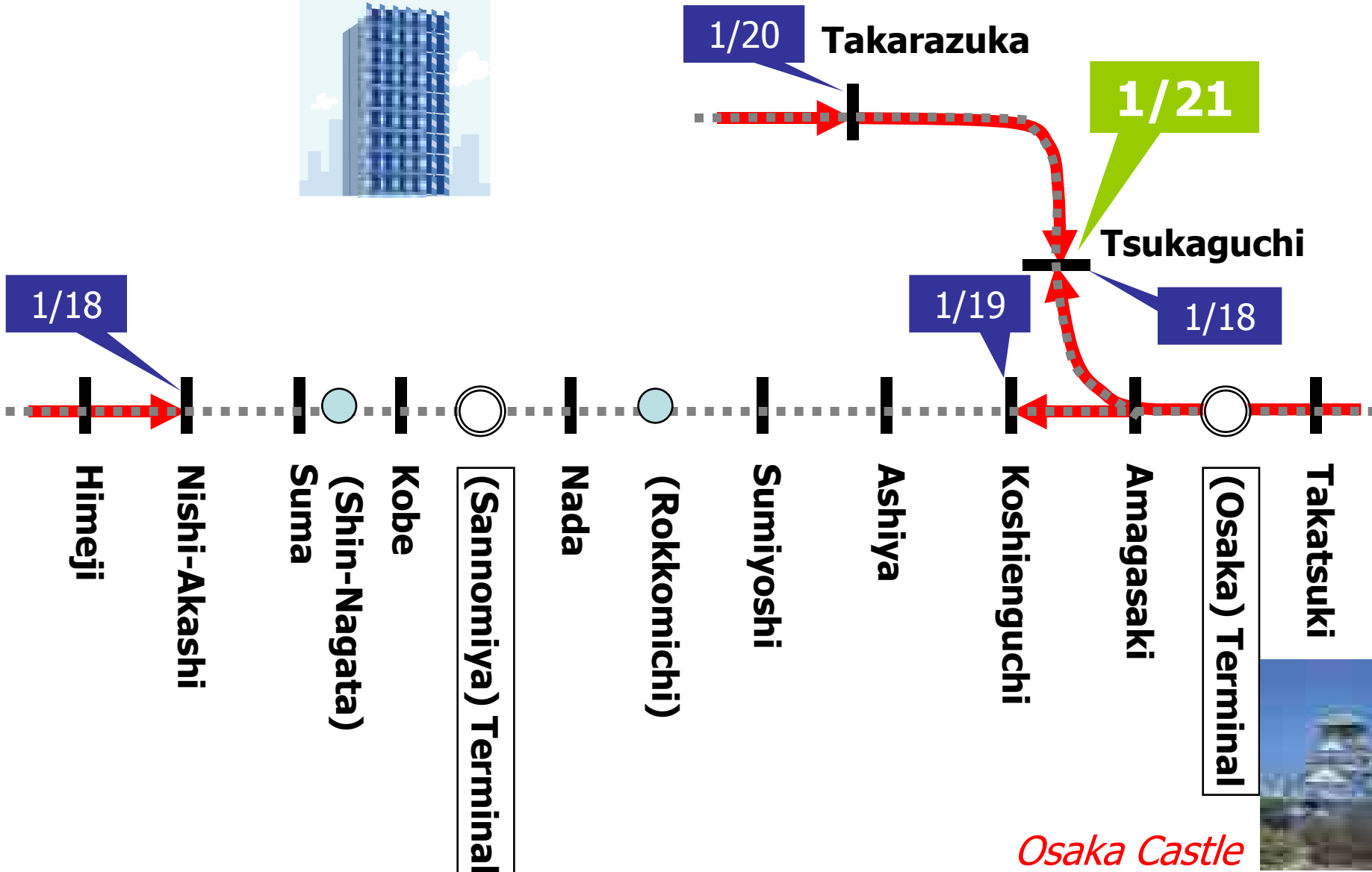
Civil Engineering Work: Bridge Beam Reuse

- Iron sheet supported technique

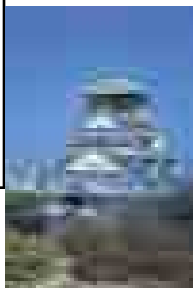


Daily Timetable Changes

Kobe City Hall



Osaka Castle



Daily Timetable Changes

- Takarazuka Line reopened four days after earthquake (1/ 21) by working around the clock

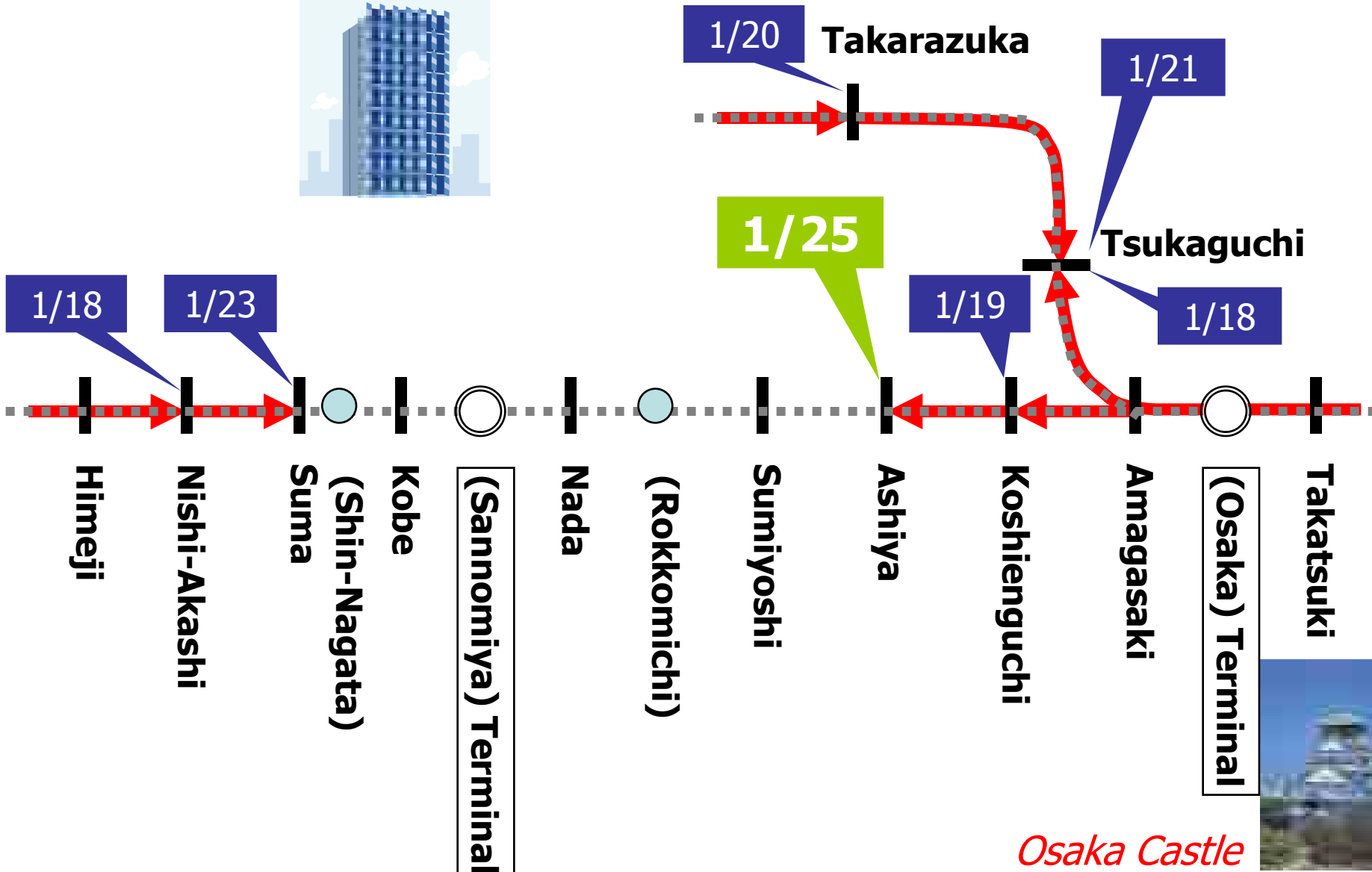


Status immediately after earthquake



Daily Timetable Changes

Kobe City Hall



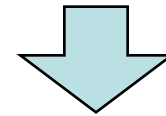
Daily Timetable Changes

- Resumption of services using a makeshift platform



1/25

(8 days after)

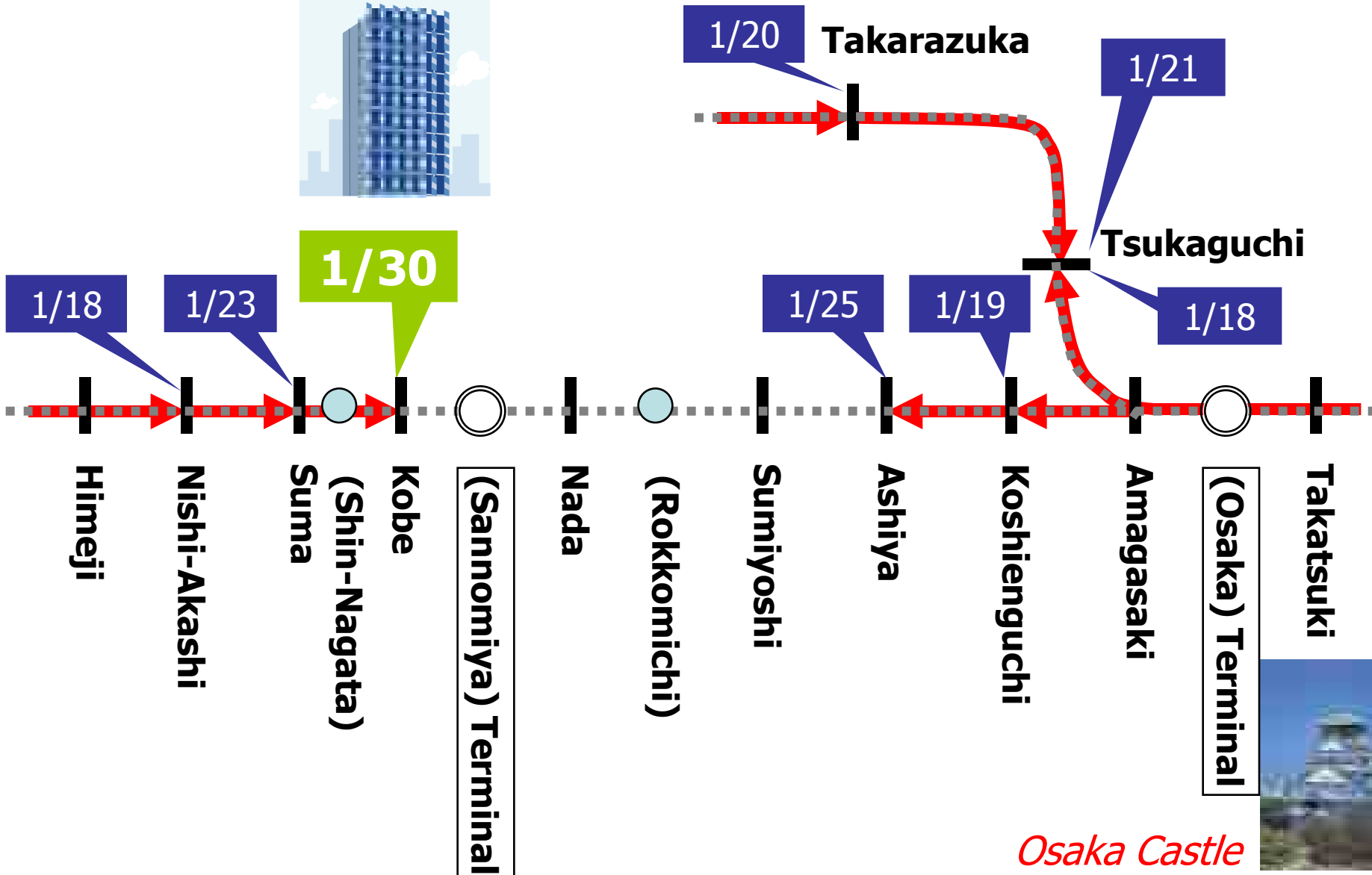


Status immediately after
earthquake

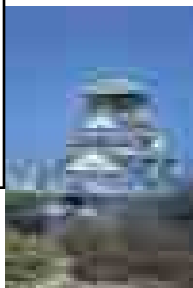
Ashiya Station

Daily Timetable Changes

Kobe City Hall

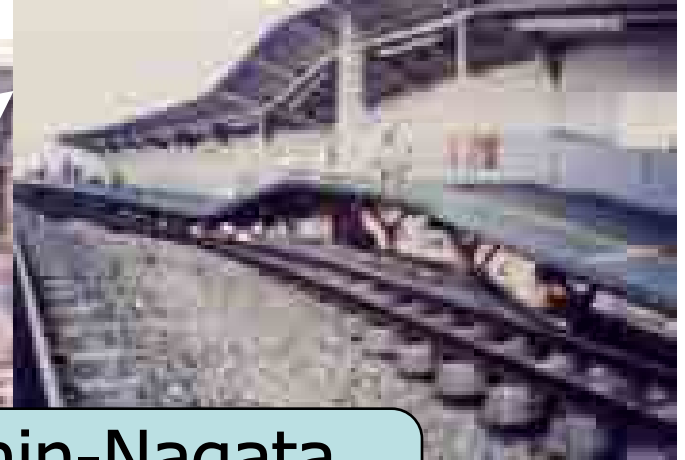


Osaka Castle



Daily Timetable Changes

- Trains did not stop at heavily-damaged stations

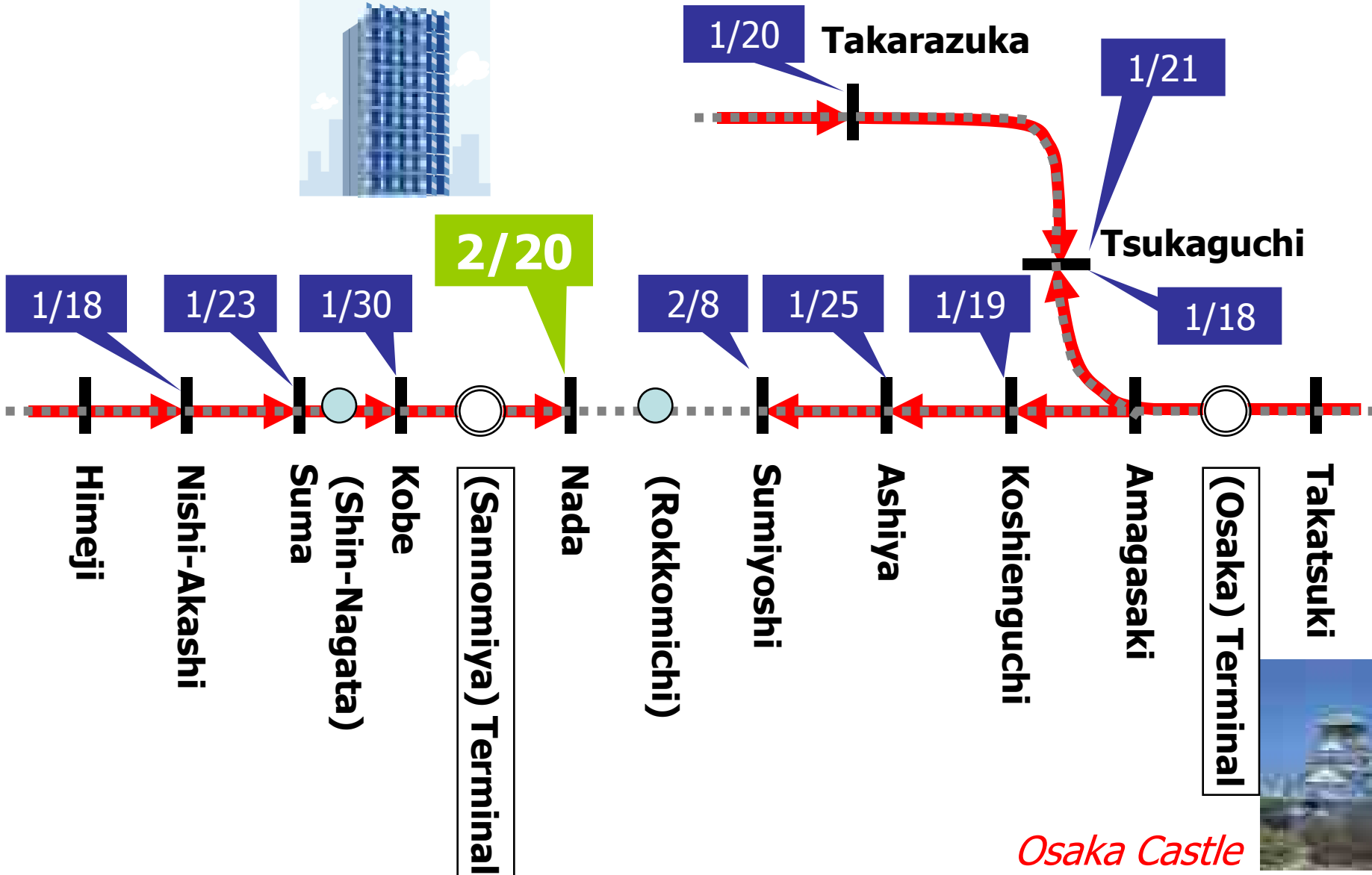


Shin-Nagata
Station



Daily Timetable Changes

Kobe City Hall

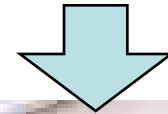


Daily Timetable Changes



2/20

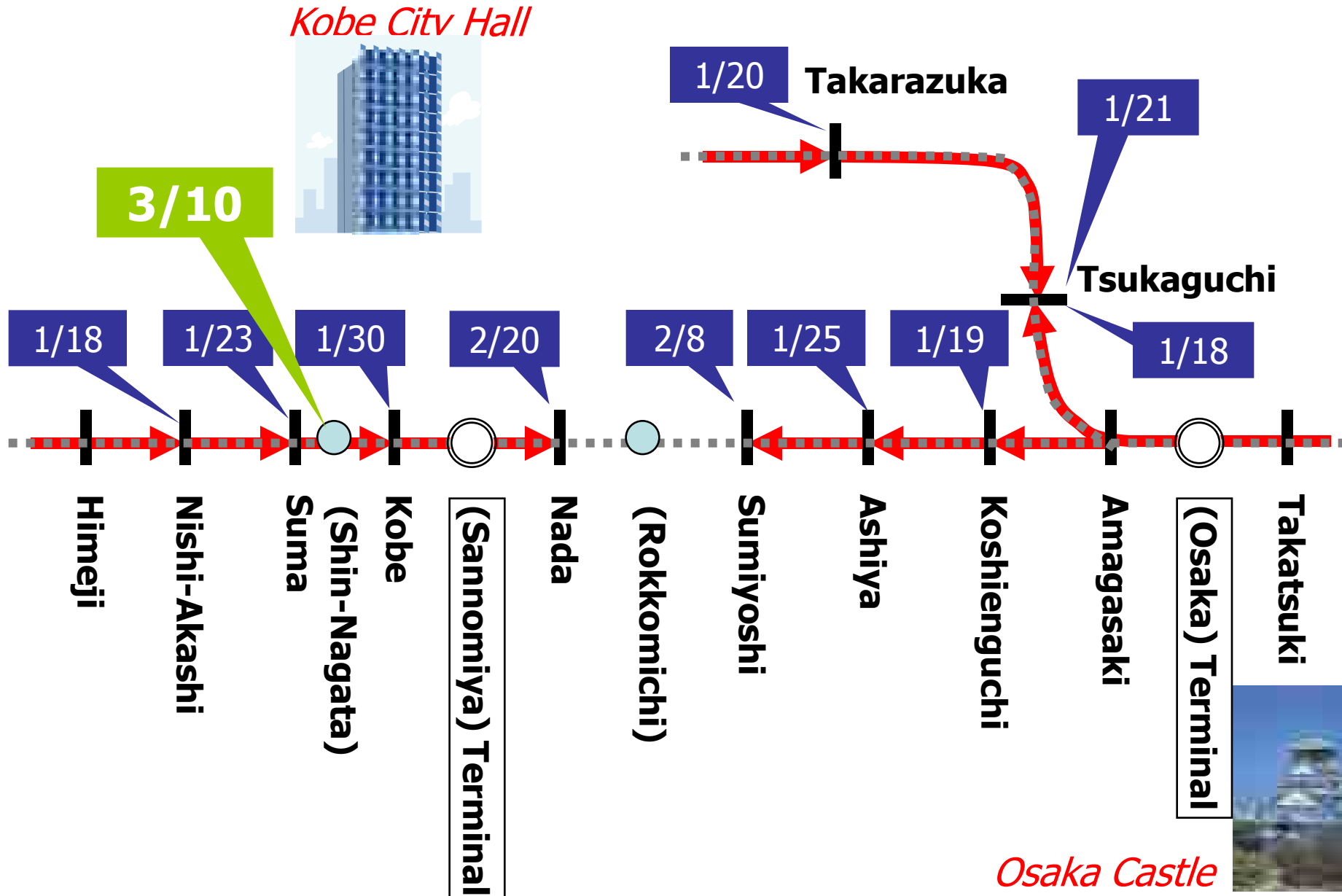
(34 days after)



Nada Station



Daily Timetable Changes



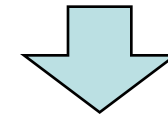
Daily Timetable Changes

- Resumption of services at makeshift stations

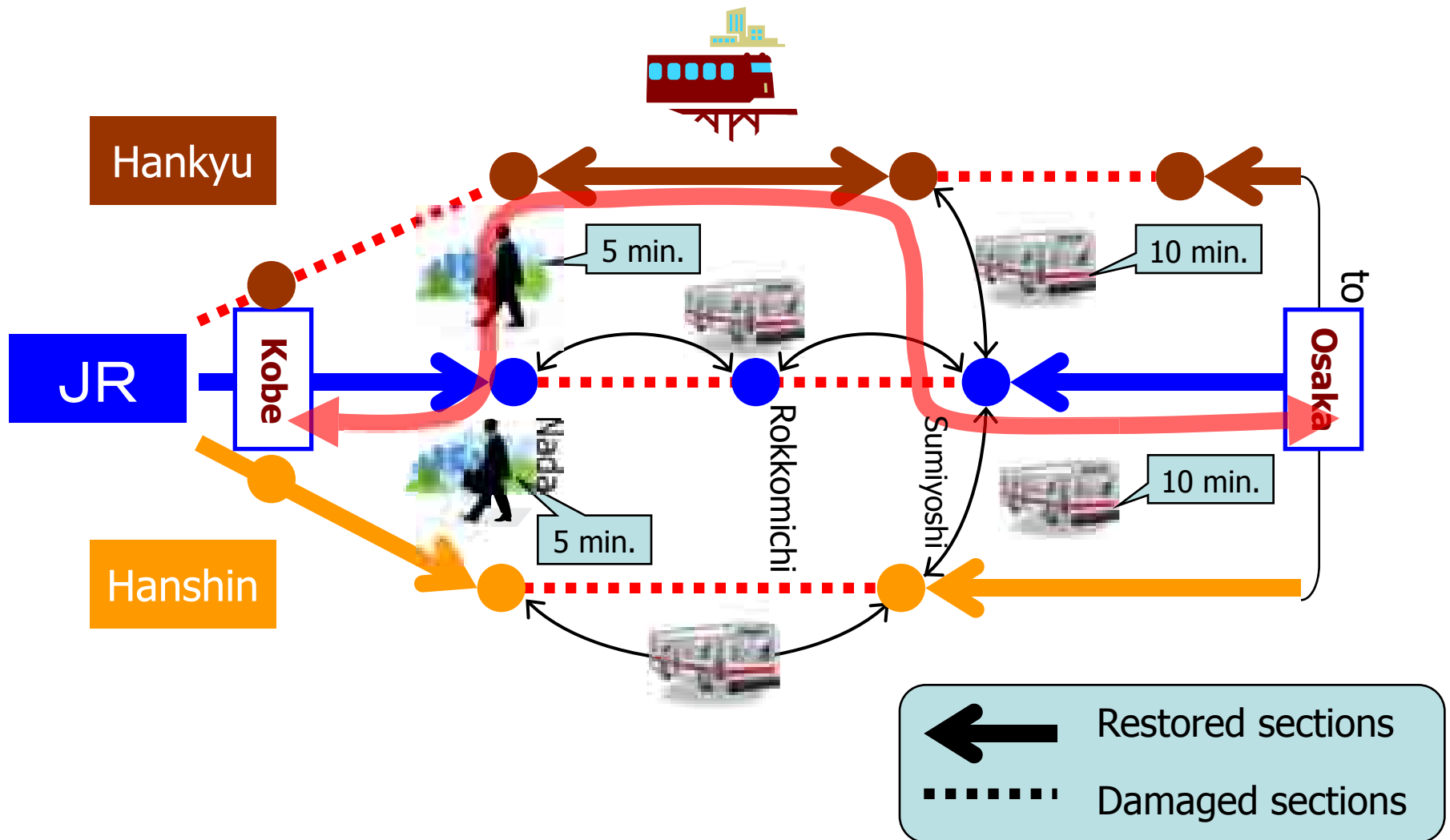


Shin-Nagata Station

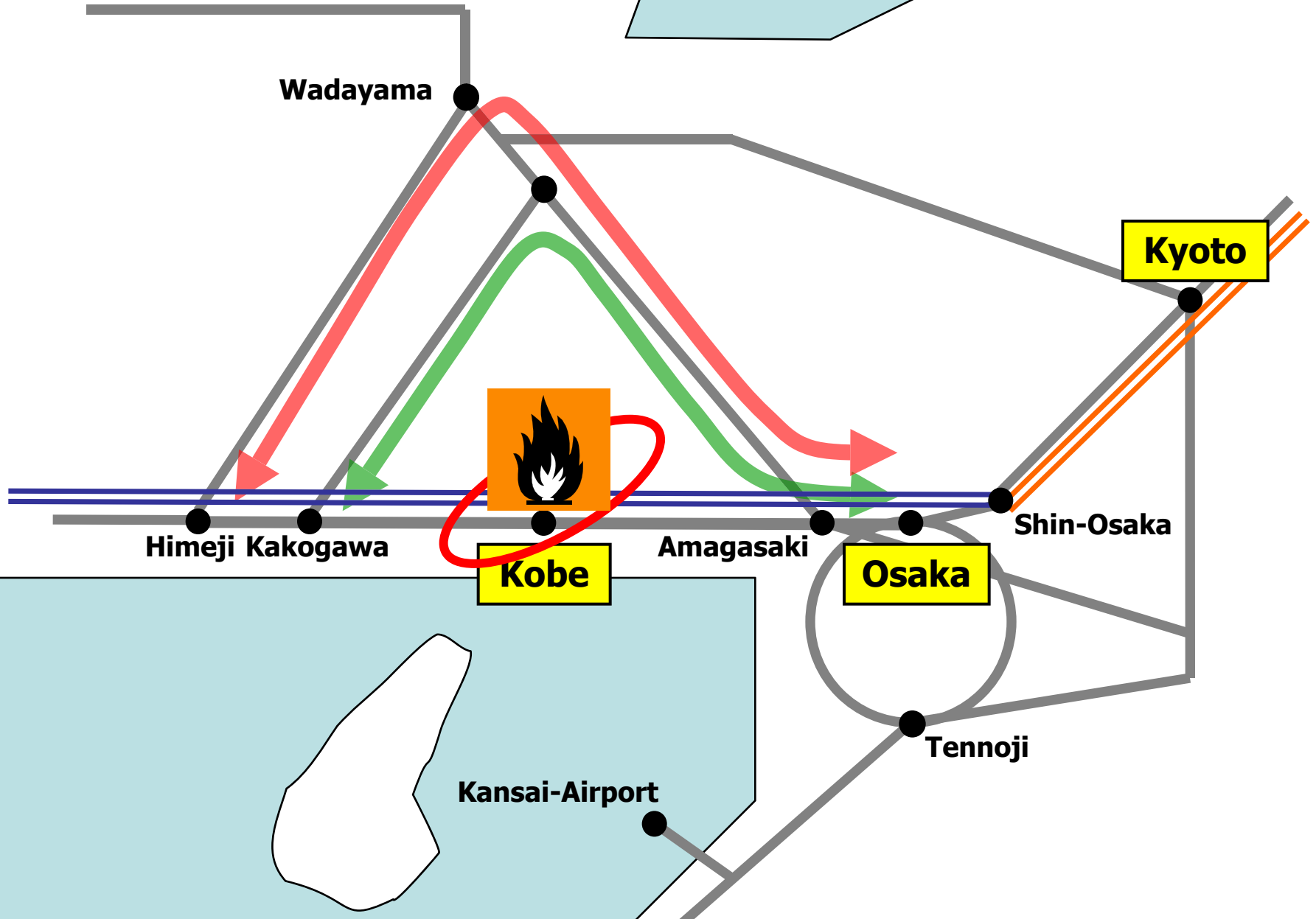
3/10
(52 days after)



Teaming Up with Rival Railway Companies



Circuitous Route



Circuitous Route

- Heavily crowded with transfer passengers



Wadayama Station

Daily Timetable Changes

- Appearance of timetable adjustment



Self-Composed Behavior of Local Citizens in Afflicted Area

- Commuters queuing neatly
- 10 yen coin in a public telephone
⇒ Consideration for others

Commuters Queuing Neatly for Alternative Bus Services



Resumption of Services along Entire Line (Conventional Lines)



Rokkomichi Station



Resumption of Services along Entire Line (Conventional Lines)



Rokkomichi Station

Resumption of Services along Entire Line (Conventional Lines)



➤ Test run
3/30



Resumption of Services along Entire Line (Conventional Lines)

51

4/1(73 days after)



Rokkomichi Station

“Thank you to everyone involved in recovery work. Rokkomichi will be reborn.”

Resumption of Services along Entire Line (Shinkansen)



Before



After



Resumption of Services along Entire Line (Shinkansen)

4/8 (80 days after)



high- speed
rail test vehicle



Shin-Kobe Station

Role of Financial Director

- Publication of financial results at a time when cost of recovery was still uncertain
- Profit registered ahead of public offering

Crisis Control Measures after Earthquake

- Introduction of urgent earthquake detection and alarm system
- Antiseismic reinforcement work
- Establishment of Second Shinkansen General Control Center

Response to Earthquake Experience

- Shift from disaster prevention to disaster mitigation
- Recognition of need for wide-ranging cooperation in various fields
- Review of risk management system

IT Risk Management

- 1995 was the first year of the age of the Internet and voluntarism
- Further responses for the Web 2.0 age

Lessons Learned from Earthquake Experience

- Be humble in the face of nature!
- Decision-making process in abnormal circumstances