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

WEST JAPAN RAILWAY COMPANY

Takayuki Sasaki
Welcome to Kyoto!

- Outline of JR-West
JR West Service Area

Shinkansen: 644km
Conventional Lines: 4,380km

JR-West

JR-Hokkaido
JR-East
JR-Central
JR-Kyushu
JR-Shikoku

Paris 650km Milan
Shanghai 1,100km Beijing

Hakata 644km Osaka 553km

Tokyo
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)

- Osaka
- Kobe
- Kyoto
Damage Overview

- Deaths: 6,433
- Completely and semi-destroyed homes: Approx. 250,000 houses (460,000 households)
- Estimated cost of damage: Approx. \( \times 10 \) 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)

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

Kobe City Hall

1/20

1/21

1/25

1/18

1/19

1/23

1/20

1/21

Himeji

Nishi-Akashi

Suma

Kobe

(Sannomiya) Terminal

Nada

(Rokkomichi)

(Sannomiya) Terminal

Sumiyoshi

Ashiya

Koshienguchi

Amagasaki

(Takatsuki)

(Tsukaguchi)

Osaka Castle
Daily Timetable Changes

- Resumption of services using a makeshift platform

Status immediately after earthquake

Ashiya Station

1/25 (8 days after)
Daily Timetable Changes

Kobe City Hall

1/30

Himeji
Nishi-Akashi
Suma
Kobe
(Sannomiya) Terminal
Nada
(Rokkomichi)
Sumiyoshi
Ashiya
Koshienguchi
Tsukaguchi
Takarazuka
Kobe City Hall

1/18
1/23
1/25
1/19
1/18
1/21
1/20
Daily Timetable Changes

- Trains did not stop at heavily-damaged stations

Shin-Nagata Station
Daily Timetable Changes

Kobe City Hall

1/18 Himeji
1/23 Nishi-Akashi
1/30 Suma

1/18 Kobe
1/23 (Shin-Nagata)
1/30 (Sannomiya) Terminal

2/20

2/8 Nada
1/25 (Rokkomichi)
1/19 Sumiyoshi

1/20 Ashiya
1/21 Koshienguchi

1/18 Koshiguchi
1/21 (Osaka) Terminal

Takarazuka

1/20

Osaka Castle
Daily Timetable Changes

Nada Station

2/20
(34 days after)
Daily Timetable Changes

- Resumption of services at makeshift stations

Shin-Nagata Station

3/10 (52 days after)
Teaming Up with Rival Railway Companies

Hankyu

JR

Hanshin

Restored sections

Damaged sections
Circuitous Route

Himeji
Amagasaki
Kakogawa
Kobe
Shin-Osaka
Tennoji
Kansai-Airport
Wadayama

Kyoto
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)

4/1 (73 days after)

“Thank you to everyone involved in recovery work. Rokkomichi will be reborn.”
Resumption of Services along Entire Line (Shinkansen)
Resumption of Services along Entire Line (Shinkansen)

4/8 (80 days after)

Shin-Kobe Station

high-speed rail test vehicle
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
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