

## Role of Ships and Harbours in Disasters

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### Background of the presentation

High standard life, social system and infrastructures are fully established in Japan, especially in electrical ways. Once a disaster happens, we recognise how our life is standing on fragile "electric castle" like a sand castle in a beach.

Japanese people is sometimes assumed as "easy-to-forget". We should establish crisis management system against such as failures in nuclear plants, big oil spills by tanker casualties, hostages in Japanese ambassador's residence in Lima etc.

Ships and harbours are just an example. Any discussions from such point of views are appreciated.

### About the presenter

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Research filed : ship manoeuvrability and controllability, marine traffic system

## Contents

- Introduction
- How did ships played at the quake?
- Proposal for ships role in disasters
- How was Kobe Port affected by the quake?
- Is full recovery of the port functions satisfied?
- How does the reborn Kobe Port should be?
- Closing remarks

Other topics interesting

- 1) What is natural disasters in your country?
- 2) Can ships and harbours contribute in such disasters in your country?
- 3) How do you feel about ships and harbours in your country?
- 4) Further discussions, if you join.

## Introduction

- Great Hanshin Earthquake statistics
- Estimate of damage of the Great Hanshin and Awaji Earthquake

Statistics available at <http://www.kobe-cufs.ac.jp/kobe-city/quake/report.html>

Total damage is estimated as JPY 9,920 billion( $10^9$ ) or equivalent to US\$82.7 billion( $10^9$ ).

Harbour facilities were suffered about double damage than highway damage and triple of railroad damage.

The report "Great Hanshin Earthquake Statistics"

<http://www.kobe-cufs.ac.jp/kobe-city/quake/report.htm>



## GREAT HANSHIN EARTHQUAKE STATISTICS

### 1. How it happened

- Date 5:46 a.m. January 17, 1995
- The Epicenter of the Earthquake  
The Northern Part of Awaji Island (N 34.6 E 135.0)
- The Depth of Earthquake 14 kilometers
- Force 7.2 on the Richter scale, 6 or 7 on the Japanese scale

### 2. Damage

- Victims (as of March 9)
  - Dead 3,852
  - Missing 1
  - Injured 14,679
- Housing
  - Total 472,160 houses (before the quake)
  - Fully destroyed 54,949
  - Half destroyed 31,783
- Fires
  - Number 176
  - Burned-down Area 65.85 ha
  - Burned-down Buildings 7,377
  - Fully burnt 7,046
  - Half burnt 331
- Evacuees (as of March 19)
  - Temporary Shelters 441
  - Evacuees 114,679 people (max. 232,403 as of Jan. 26)
- Rescue Personnel 61,820
  - Police 16,000
  - Fire Officials 3,400
  - Fire Volunteers 14,200
  - Self Defence Force 25,700



Maritime Safety Agency 1,000  
Medical Staff 1,520

The report "Great Hanshin Earthquake Statistics"

<http://www.kobe-cufs.ac.jp/kobe-city/quake/report.html>

Foreign Rescue ... 6 Teams, 106 people  
Foreign Medical Team ... 8 Teams, 75 people

3. Establishment of the Kobe City Earthquake Relief Headquarters  
Established at 7:00 a.m. January 17, 1995

Director ... Mayor of Kobe  
Deputy Directors ... Deputy Mayors of Kobe  
Members ... Director Generals

4. Relief Supplies

Kobe City has contracted wholesalers and shops to supply goods in case of disaster

Initial Supplies Blankets, rice bales, bread.

In the first days after the earthquake, relief supplies were collected at ward offices, and then transported to evacuee shelters. Then, four big distribution centers were established at the beginning of February.

64 organizations (including Governments) from 22 countries have sent relief supplies to Kobe as of March 14

5. Damage to Public Facilities

= Utilities

Power 100% Restored on Jan. 23  
Gas 90.5 % Restored(as of March 24)  
Water 99.9 % Restored(as of March 25)

= Railways

JR(Regular)

The line between Sumiyoshi and Nada(both are in the eastern area of Kobe) is out of service, and 65% of the usual operation has been restored. Full service is expected to resume on April 1st, so that Kobe and Osaka will be directly be connected.

JR(Shinkansen)

The line between Shin-Osaka and Himeji is out of service. Full service is expected to resume in April

Hankyu

It is a private railway, and it connects Kobe with Osaka and Kyoto. It is now partially out of order between Kobe and Nishinomiya. The entire line will be operational by the end of August.

Hanshin

It is a private railway, and it connects Kobe with Osaka. It is now partially out of order in the eastern area of Kobe. The entire line will be operational by the end of September.

Municipal Subway

The Operation of the entire line resumed on Feb. 16. Now all stations are in operation except for Kamisawa Station. Fully Operational on March 31

Port Liner

It connects Port Island to the mainland. It is now completely out of service, and will be partially restored by the end of August.

Rokko Liner

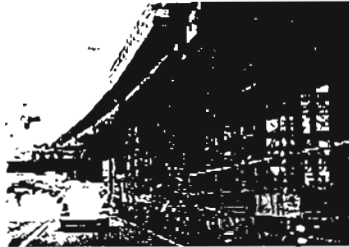
It connects Rokko Island to the mainland. It is now completely out of service, and will be fully restored by the end of August.

= Road

The Kobe Line of the Hanshin Highway, which connects Kobe and Osaka, will be reopened by the end of 1996. (The section between Kyobashi and Maya will be partially reopened by March, 1996.)

The report "Great Hanshin Earthquake Statistics"

<http://www.kobe-cufs.ac.jp/kobe-city/quake/report.html>



= Port

Almost all of the waterfront extending for 116 km was damaged. Only 9 out of 239 berths escaped damage. All the gantry cranes sustained. Every effort has been made to restore them, and 107 berths have been restored to operation as of Mar 16. Completion rehabilitation of repairs is expected in two years.

= Schools

223 out of 345 public schools were damaged. 35 schools were completely destroyed and 38 were seriously damaged. Every effort has been made to restore them, and 249 schools have fully reopened as of March 6.



= Medical Establishments

Two out of three municipal hospitals were damaged. Three of 112 hospitals in Kobe were totally destroyed. Another 9 hospitals were half destroyed and 88 were slightly damaged. As of Feb. 16, 105 hospitals, 988 clinics (72.5%) and 480 dental clinics (59.5%) are operating.

= Local businesses

Synthetic leather shoes

158 out of the 192 member companies of the Shoe Federation were seriously damaged

Rice Wine (Sake)

21 out of the 31 breweries were seriously damaged

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Go back to "[Disaster of KOBE City](#)"



[KOBE City Home Page](#)

Table I                      Estimates of Damage of  
the Great Hanshin and Awaji Earthquake

Items	Estimates of Damage (x10 <sup>11</sup> Yen)
Total Estimates of Damage	99.2
Main Items	
Houses & Buildings	58.0
Harbour Facilities	10.0
Commercial & Industrial Belongings	6.3
Highways	5.5
Gas, Electricity and Water	4.7
Railroads	3.4
Schools, Colleges etc.	3.4
Civil Facilities except Highways	2.8

## How did ships played at the quake?

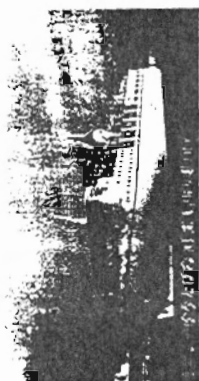
- Traffic jam
- Histogram of ships used at the quake
- Helicopter and heliport usage
- Temporary sea traffic routes
- Merits of ships and expected applications

Some additional slides demonstrates how did ships play a role.

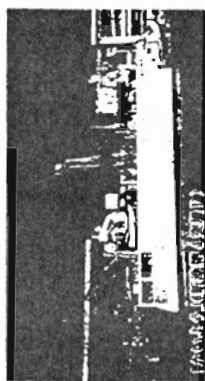
Merits of ships are tabulated in a slide.



# 支援活動・宿泊施設に船舶大活躍



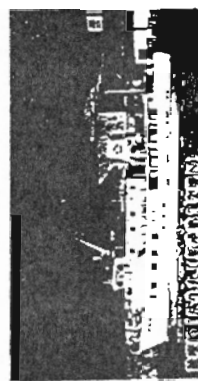
【神戸市】震災直後の支援活動に活用された船舶



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【神戸市】震災直後の支援活動に活用された船舶

# 神戸ヘリポートもフル稼働

震災後の神戸ヘリポート利用状況

利用日	利用時間	利用回数	利用人数	利用機数	累計
1/17	11	19	2	37	1074
1/18	30	111	2	40	1114
1/19	31	212	2	26	1130
1/20	121	315	2	21	1101
1/21	101	436	2	16	1177
1/22	89	476	2	18	1195
1/23	89	504	2	25	1220
1/24	91	658	2	20	1249
1/25	81	722	2	21	1270
1/26	81	780	2	19	1289
1/27	56	842	2	16	1305
1/28	57	894	2	11	1316
1/29	52	910	2	16	1332
1/30	52	908	2	24	1356
1/31	39	1037	2	11	1367



神戸ヘリポートの緊急輸送活動

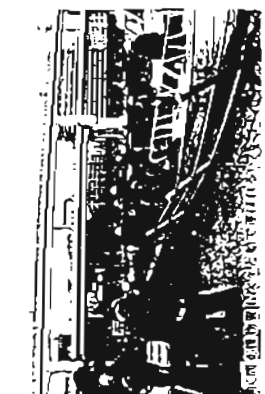
# 緊急救援物資は交通渋滞を避けて海上輸送



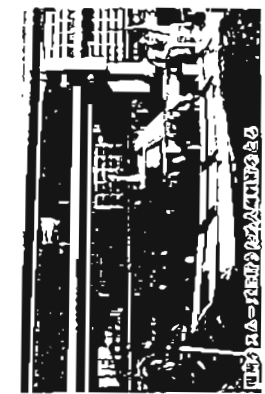
自衛隊の大型輸送艦に搬入された救援物資



海上保安庁の巡視船で運ばれた救援物資



自衛隊の大型輸送艦に搬入された救援物資



海上保安庁の巡視船で運ばれた救援物資

1月	2月							3月						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
避難所施設														
・宿泊施設														
・宿泊施設														
・宿泊 入浴														
・入浴														
海上支援拠点														
・炊き出し														
・ホテル・ロッジ														
・支援要員宿泊														
・支援要員宿泊														
・電力復旧要員														
・電力復旧要員														
・消防救急要員														
・消防救急要員														
・消防救急要員														
・土木技術員														
・調査支援														
・医療団														
・医療団														
・港湾関係要員														
・ガス復旧要員														
・ガス復旧要員														

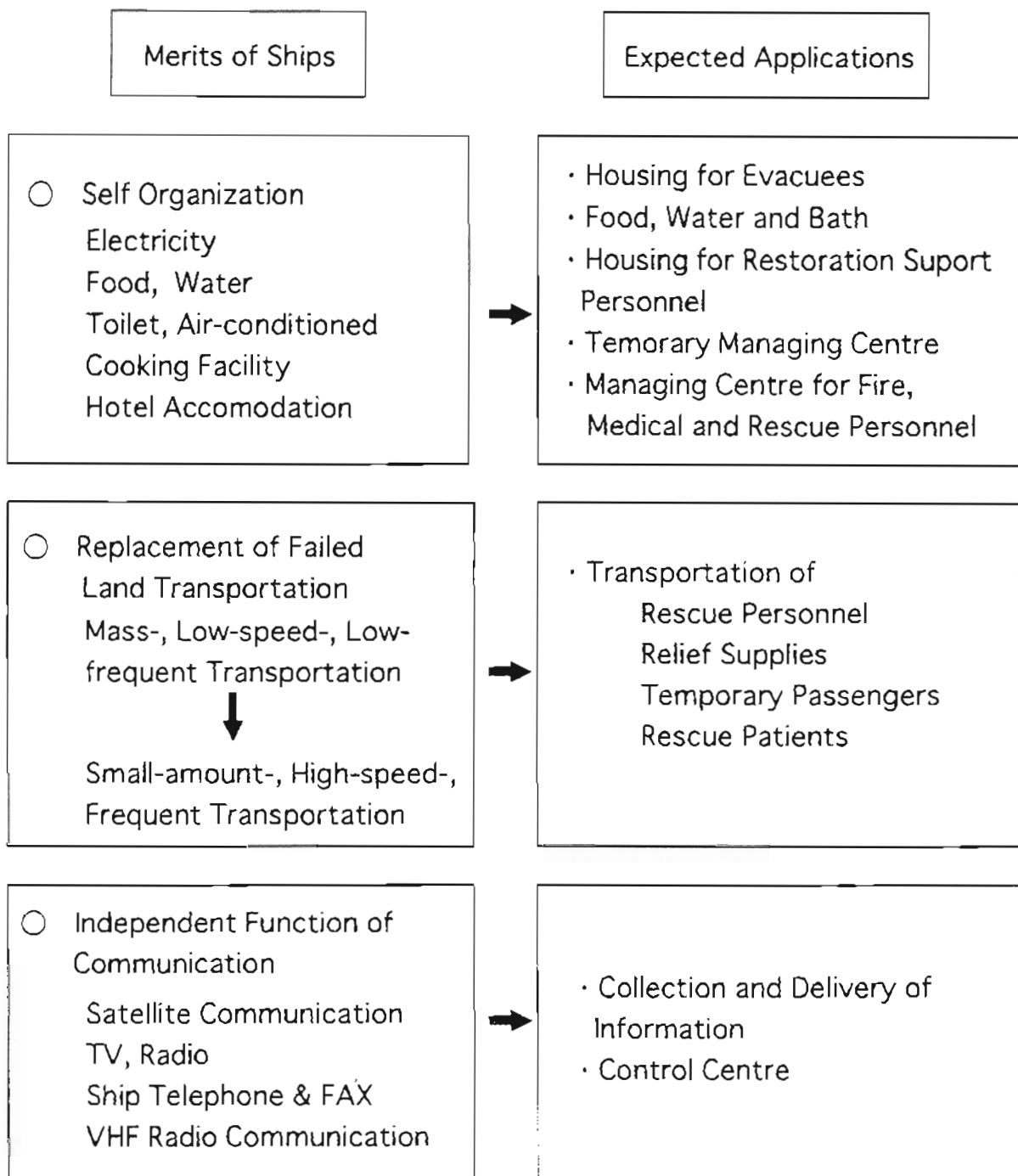


Fig. 1 Functions of Ships and Its Expected Applications

## Proposal for ships role in disasters

- More effective usage of ships
- Usage of small boats

### Obstacles

Social system, regulation and facilities

## Usage of small boats

- Merit
  - not require special berthing facility
  - but only require fundamental one
- Size assumed
  - up to 100 ton, probably 50 ton

## Usage of small boats

### ■ What kind of boats are available?

#### ■ Volunteer

- Fishing boats or pleasure boats
- Chartered by companies

#### ■ Professional

- Fireboat
- Coast guard boat
- Lighthouse maintenance boat

## Small boats Usage: What kind of services are assumed?

- Foods etc. supply
- Information collection, men for goods-delivery transport
- Transit to large vessels offshore
- Emergency transport between artificial islands
- Alternative transport
- Transport workers and injured

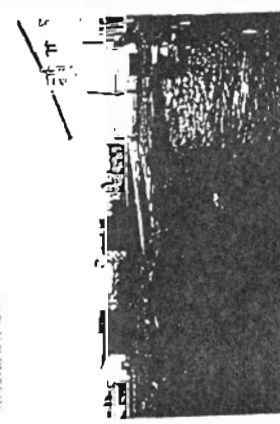
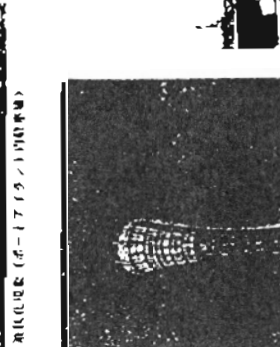
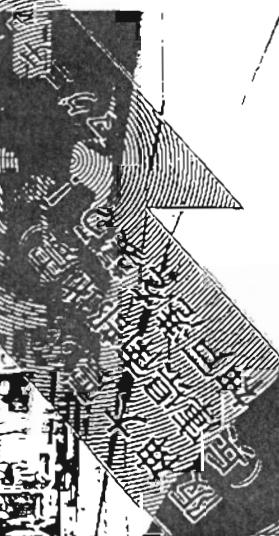
## How was Kobe Port affected by the quake?

- All gantry cranes were destroyed by liquefied ground
- Time schedule of reconstruction
- Temporary agreement of 24-hour service with union

## Is full recovery of the port functions satisfied?

- How was Kobe Port in share of export and import in Japan?
- Report of Port of Kobe Reconstruction Committee
- Comparison of services of other Asian ports
- Statistics

天保十一年十一月十八日天明 兵庫  
 赤松川郡を震動するものありしは、このノ群衆より此地に  
 が津川を越え、神戸港の港に幾艘  
 には波動的な波を起した。  
 其の因を以てする國難計地である  
 神戸港は日本の物流中心であ  
 り、其の影響が甚だしくあり、  
 以下は、ノスガのまじな地、  
 の神戸港周辺の地を以てする。



# 震災直後の破損状況



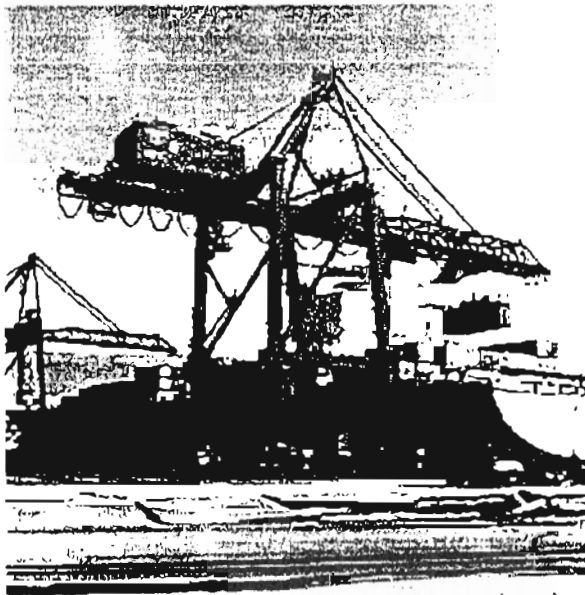


## Reconstruction OF PORT of Kobe

[next]

The Port of Kobe suffered heavy damage from the Great Hanshin and Awaji Earthquake. Discontinued functions of the Port of Kobe, Japan's largest container port, are seriously affecting not only the local economy and community life of Kobe but also the entire economy and distribution system of Japan. In order to reconstruct the Port of Kobe at the earliest possible date, the national government, municipal government, industries and organizations related to the Port are working together and concentrating their efforts around the clock.

### Resumption of Use of Gantry Cranes at the Container Terminal.



The reconstruction of the Port of Kobe is proceeding steadily at the fast pace. On the morning of March 20, the first of the gantry cranes to be repaired was able to load and unload the Gao He (a full container-type vessel, 2,760 TEU, 37,143 tons) owned by COSCO. Prior to this, loading/unloading operations were conducted by utilizing several other means: RO/RO boats, conventional ships, and container ships with cranes. By the end of April, six more berths will resume full service operation using gantry cranes, and by the end of June, two further berths will open. This will be helpful in the reconstruction of the Port of Kobe, which has been referred to as the largest container terminal in Japan.



Kobe Port

### Reconstruction Schedule.

Every effort will be made to completely reconstruct the functions of the Port of Kobe in approximately two years.

#### 1. Berthing places

##### (1) Provisional service operation

Container Terminal	Maya Piers QR Quay (2 gantry cranes).	March 20, 1995
	Port Island PC-2	Around end of April, 1995
	PC-4	
	PC-7	
	Rokko Island PC-2	
	PC-4	
	PC-7	

Multipurpose terminal	Port Island Berth D Rokko Island Berth X (capable of handling of containers)	Around end of June, 1995
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##### (2) Full service operation (detail)

Container Terminal	1/3 of whole	Within 1995
	Remaining 2/3	Within approx. 2 years
Ferry Terminal	2 berths each at Higashi Kobe Ferry Terminal (Public) and Rokko Island	Within 1st half of fiscal 1995.

Remaining 3 berths	Within fiscal 1995
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liner 15 berths at Port Island Within fiscal 1996  
Terminal (Kobe Port Terminal Corporation)

## 2. Bridge and Elevated Roads

(1) Provisional service operation

Kobe Bridge: 2 lanes each for up and down lines Around April, 1995  
Rokko Bridge: 2 lanes each for up and down lines at present

(2) Fully reopened to traffic

Harbor Highway Kobe Bridge, Shinko No.4 Pier Ramp	Around autumn, 1996
Rokko Island - Takahama Ramp	Around autumn, 1995
Rokko Island - Maya Piers	Within 1995
Shiko - Maya Piers	Around autumn, 1996

'Maya Bridge' Maya Bridge Around August, 1995

### 3. New Transportation System

(1) Partially reopened to traffic

Port Line: C.I. Trade Center - Civic Square Late August, 1995  
C.I. Trade Center - Minami Park

(2) Fully reopened to traffic

Rokko Liner Late August, 1995

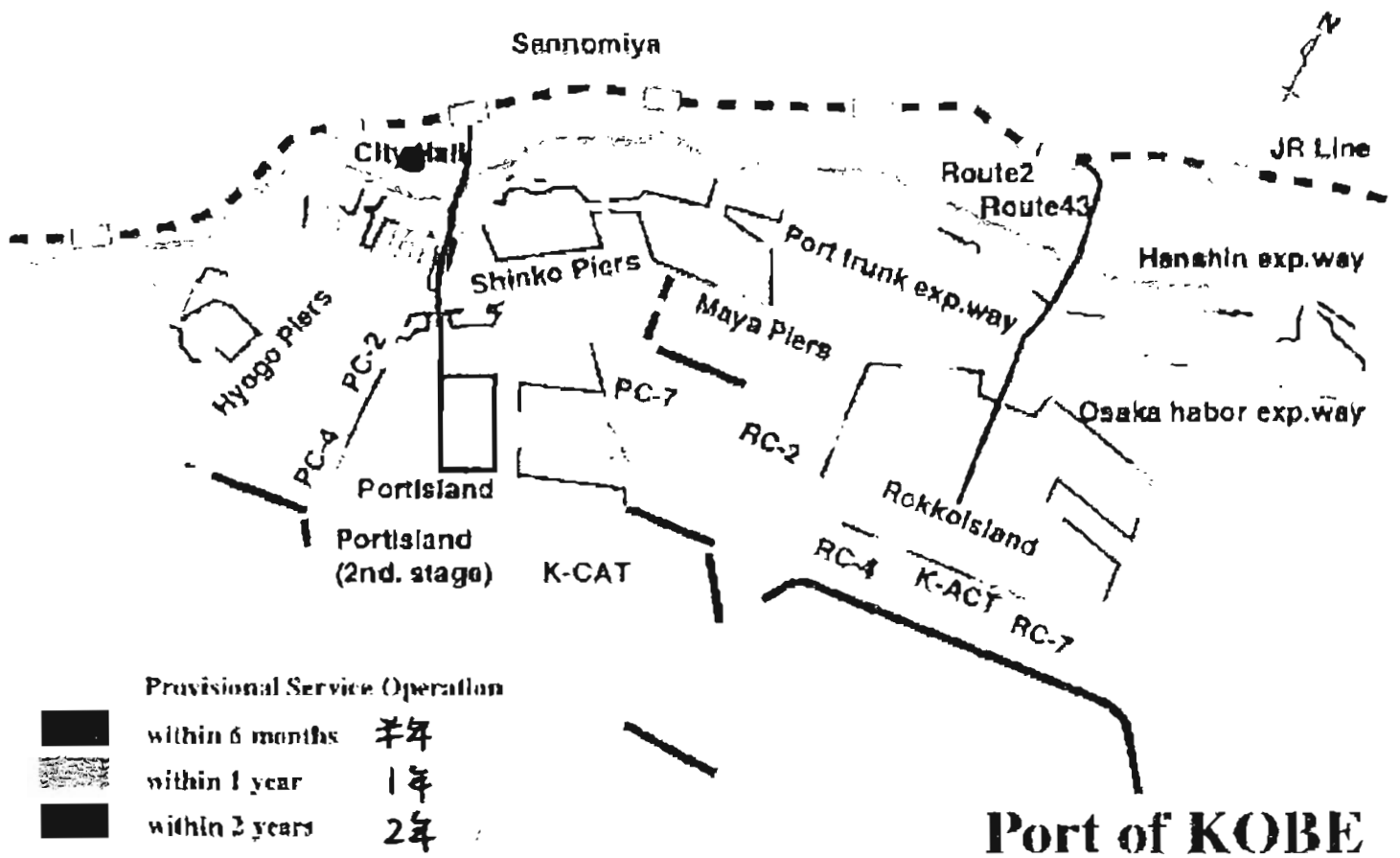
#### 4. Breakwater and Coastal Protection works

Front breakwater Within 1st. half of fiscal 1995  
Coastal protection works. By typhoon season 1995

## Resumption of Liner Services

Kobe Ferry Center.





## Reconstruction OF PORT of Kobe

[\[previous\]](#) | [\[next\]](#)

### Full-scale Operation Resumed at 6 Container Terminal Berths on April 30

On April 30(Sun.),full-scale container handling will be resumed at three berths at Port Island (PC-2,4,7) and another three berths at Rokko Island (RC-2,4,7),using two gantry cranes at each berth. Container handling has already been resumed at Maya Container Terminal,using two gantry cranes. By mid-June, the third gantry crane will have been installed in four of the above-mentioned 6 berths at the two islands. By the end of June, full scale container handling will have been resumed at two other berths (Port Island D berth and Rokko Island X berth).



Jan. '95 RC-7 container terminal.

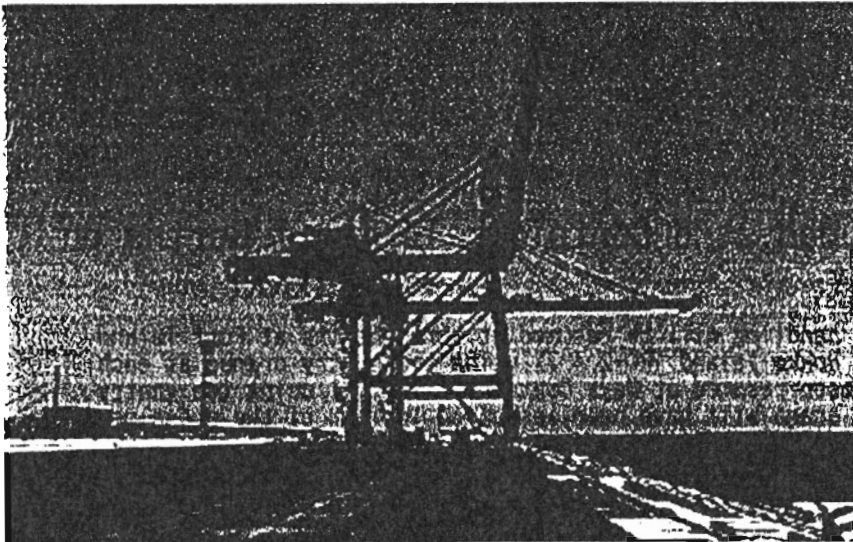


Apr. '95 RC-7 container terminal.

### Many Shipping Companies Resume Service!

Many shipping companies resumed service at container terminals that have been reconstructed for temporary use. Further more, in accordance with tentative mutual consent between port workers and operation companies of the Port of Kobe,container handling services will be provided around-the-clock.

## Port Workers and Operation Companies of the Port of Kobe Temporarily Consent to 24-hour handling Services.



An agreement was concluded concerning around-the-clock operation of container terminals and 24-hour service of container handling and gate operation on a two-shift basis (including Sundays and national holidays) between the Hyogo Prefecture, Port Terminal Operators Association, the Conference of Kobe Port and Harbor Labor Union, and the Japan Labor Union of Port and Harbor Transportation (Hyogo Head office).

The implementation of this 24-hour service will provide out-of-work port workers with jobs, and will consequently fuel reconstruction of the Port of Kobe. The 24-hour operation will begin, in principle, with the temporary resumption of the

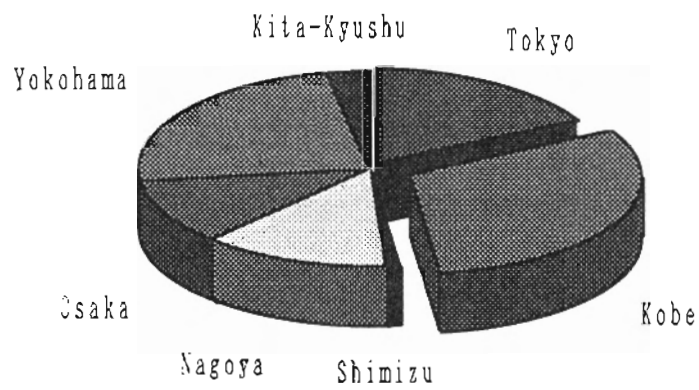
container terminals, and will terminate with the completion of their reconstruction. The details of the arrangement will be discussed by the concerned parties as the need arises. The tentative agreement is expected to improve operating efficiency and to encourage the shipping companies that are now temporarily using other ports, back to Kobe.

Wed 26, Jul, 1995

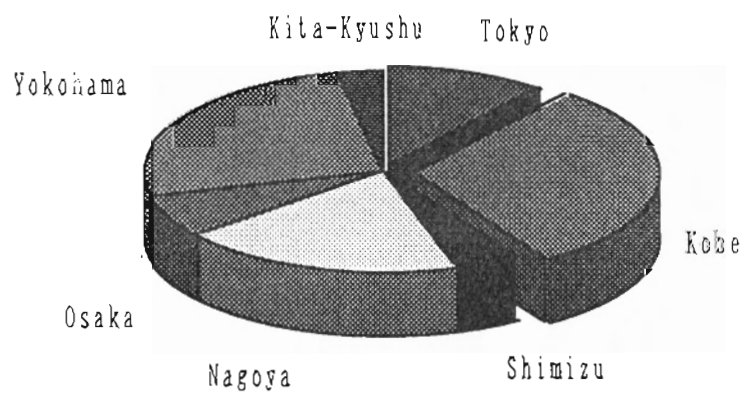


-> ["Disaster of Kobe City"](#)  
-> [Kobe City Home Page](#)

Export 1993



Import 1993



## Reconstruction OF PORT of Kobe

[\[previous\]](#) [\[next\]](#)

### Port of Kobe Reconstruction Committee Report Prepared

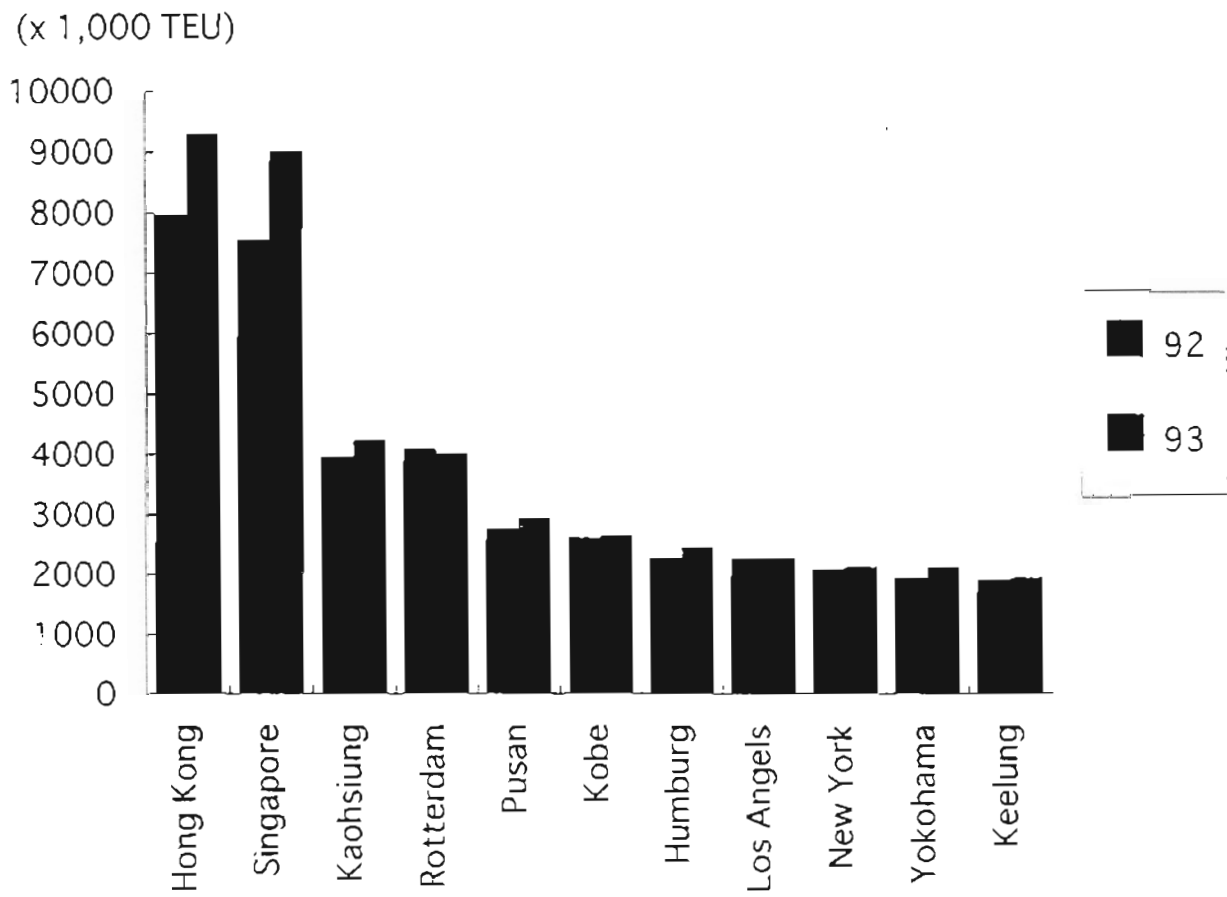
on Friday, April 28, the Port of Kobe Reconstruction Committee report was approved at the Committee's second meeting. The report comprises the following chapters:

1. the principles of the "Port of Kobe Reconstruction Plan",
2. present situation and problems ,
3. visions for the 21st century,
4. construction of a durable port resistant to natural disaster,
5. development based on examination of present situation and
6. facility reconstruction plans.

The construction of a durable port, resistant to natural disaster ,isn aimed not only at improving the durability of port facilities, but at enhancing various functions of the city that may be of benefit of citizens, should natural occur.

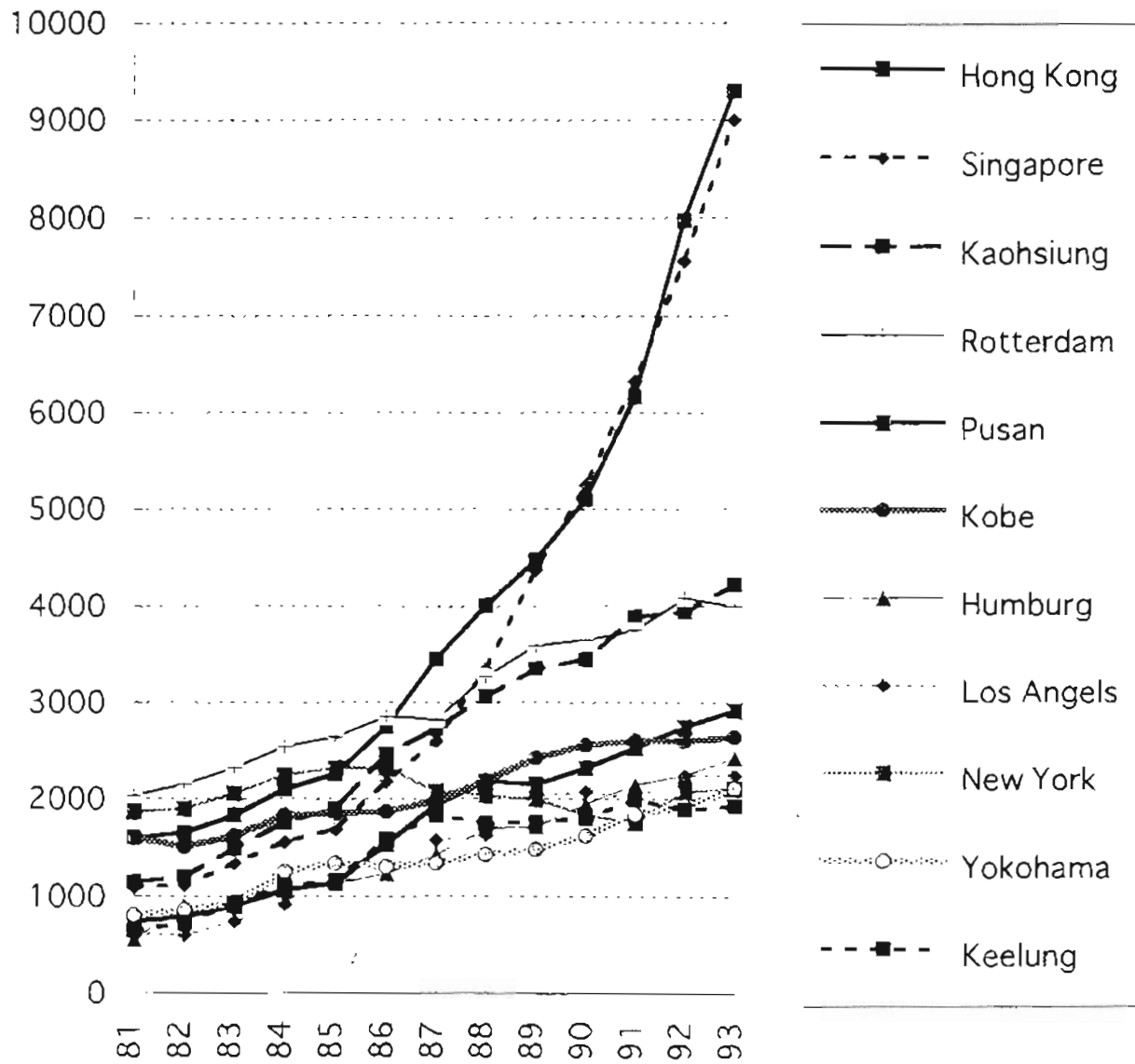
To improve the durability of port facilities, the emphasis will be on earthquake measures, as well as flood-tide and tidal-wave measures. For example, the Port intends to construct improved earthquake-resistant facilities, particularly quays. At present, three berths have already been improved in a public wharf. Although the Port Development Plan includes the construction of three additional berths, several more berths will be constructed.





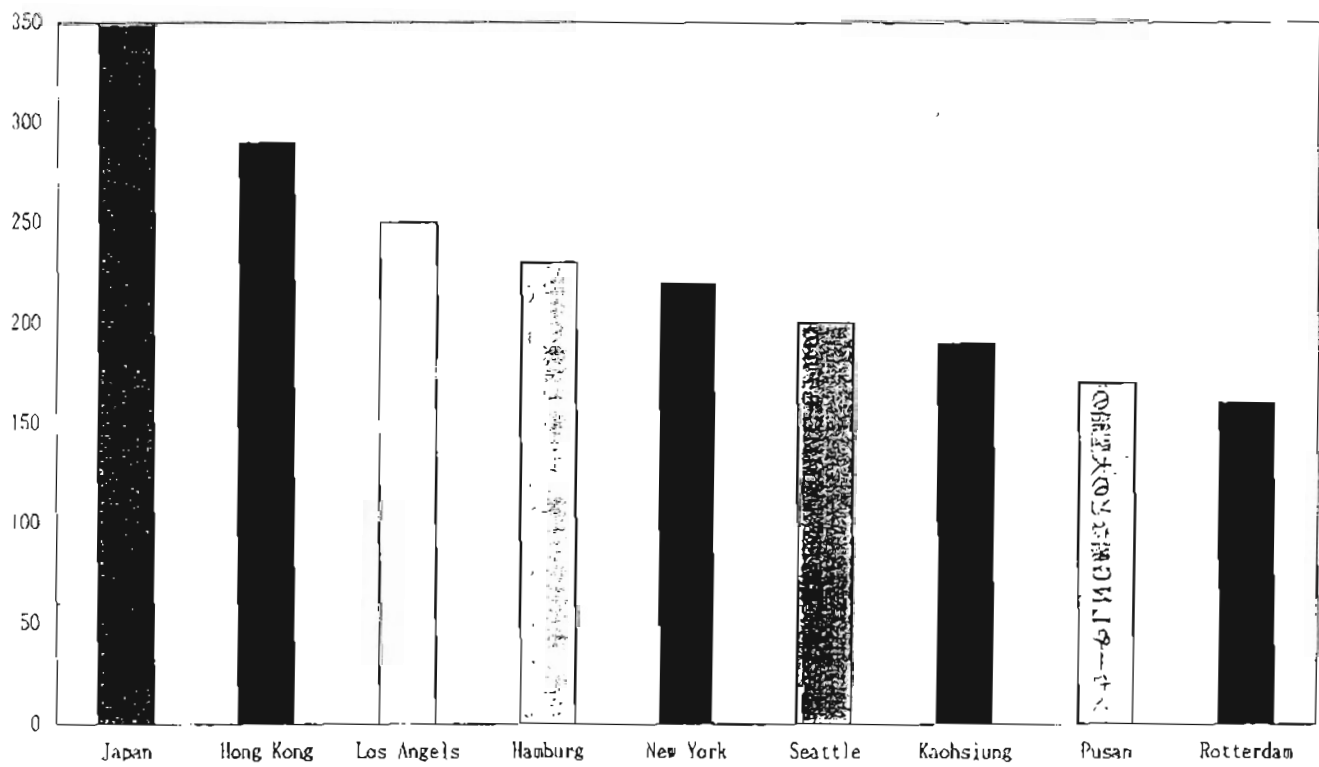


(x 1,000 TEU)



Name of Port	Kobe	Singapore	Bangkok	Hong Kong	Kaohsiung	Pusan
Running Days / year	307	365	365	362	357.5	363
Holidays	58 days Sundays, End and Start of a Year	Nil	Nil	3 days Chinese New Year Days	7.5 days New Year's Days and Chinese New Year's Days	days Chinese New Year's Day and Chinese Midautumn Day
Limitation of Entering Port	24 hours with partially limited	Nil	Nil	Nil except typhoon climate	Nil Dangerous goods only in daytime	Nil
Limitation of Berthing	24 hours with partially limited	Nil	Nil	Nil	Nil	Nil
Working Hour of Terminal	Mon. - Sat. 8:00-12:00 13:00-18:00 19:00-24:00 1:00-4:00	24 hours	24 hours (normally 8:00-16:30)	24 hours	24 hours	24 hours (20 hours for Onboarding)
Custom Service	During working hour (9:30-17:00) exception allowed	Tax products are limited	During working hour (8:00-16:30)	Tax products are limited	During working hour (8:30-17:00) Informed application available for fresh goods	During working hour Informed application available
Animal and Plants Inspection	During working hour (8:30-17:00)	24 hours	—	—	During working hour (8:00-17:00)	24 hours

Port Fees(US\$) / 40 Feet Container



## How does the reborn Kobe Port should be?

- Asian hub port or national hub port
- Air and sea cargo port
- Discussions with all of you

Kobe is the biggest port in Japan.

Kobe is the 6<sup>th</sup> biggest port in the world.

Can it maintain her position in Japan and in the world?

## Concluding remarks

- Establishment of crisis management system
- Port should be constructed under national policy
- Should rely on volunteer, or not
- Next disaster may cause us software problems, but not hardware ones