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# DISASTER MANAGEMENT SYSTEM OF HYOGO PREFECTURE

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FY 2014

# Outline of the presentation

1] Climate and disaster profile of Azerbaijan Republic and Japan
2] Legal Framework and Basic Laws For Disaster Regulations in Japan
3] Outline of Disaster Management System of Japan and Disaster Management Planning
4] Outline of Designated National and Local Administrative Organs, Public Corporations and Voluntary Organizations Responsible for Disaster Management in Japan.
5] The Great Hanshin –Awaji Earthquake as a Turning Point of Improvement of Disaster Management System of Japan as a whole and Disaster Management System of Hyogo Prefecture
6] Conclusion

So relative similarity of both Azerbaijan's and Japan's landscapes (mountainous terrain s dissected by the mountainous rivers and are bounded by water basins ) especially between Azerbaijan and and Hyogo prefecture as well as physiogeographic location particularly situation at the interface of tectonic plates makes both countries not only alike in natures but exposed to the similar natural disasters such as earthquakes and floods.

The purpose of the research is thoroughly explore elaborated through years the disaster management system and especially disaster response system of Japan and particularly disaster management system of Hyogo prefecture as one of the most disaster prone and vulnerable areas in terms of earthquake would be efficient example of holistic and tailored disaster management systems and implementation of the most advanced features of this system into indigenous disaster management system would be pretty beneficial.



## Disaster Profile of Azerbaijan Republic (Floods)

**Azerbaijan is susceptible to heavy flooding because of its topography and the water-related fluctuations in the Caspian Sea.Territory of Azerbaijan Republic is included in the list of areas, where floods and inundations are observed mostly along the world. Appearance of floods in Great and Little Caucasus mountain ranges which cover almost half of countrywide territory, occurs more intensively. Most floods and inundations happen in uplands of South slope of Great Caucasus and Nakhichevan AR. Heavy showers on the territory of Azerbaijan Republic often lead to floods with damages and human casualties. A substantial part of central Azerbaijan could be flooded in case of damage to the Mingechevir water reservoir in the west. Landslides caused by heavy rains and underground water are also common case for Azerbaijan.**

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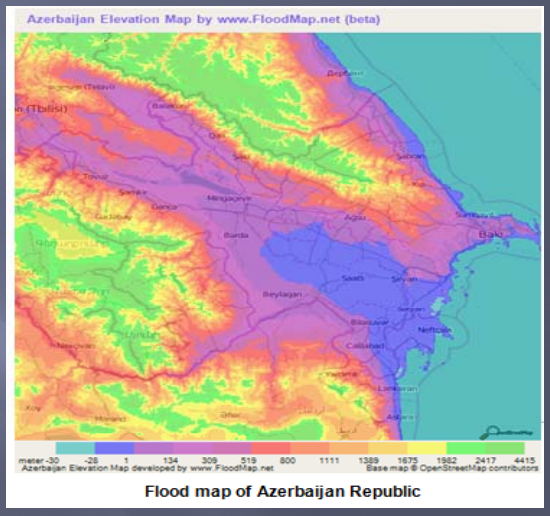



Flood map of Azerbaijan Republic

## Disaster Profile of Azerbaijan Republic (Landslides)

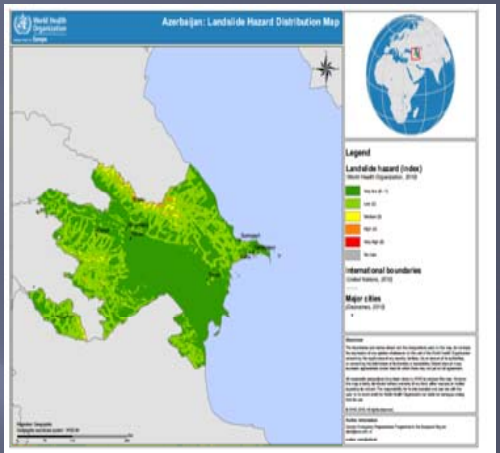
One of the main reason of landslides in rural regions of Azerbaijan is semi-nomadic animal husbandry

The number of areas in Azerbaijan which are prone to landslides has increased by four times in the past 24 years and comprises 400 that cover the areas of approximately 6,000 square kilometers.

Landslides in Azerbaijan are frequently occurring in Shamakhi-Ismayilli, Guba-Khachmaz regions and Absheron peninsula.

Landslides are usually reported in spring and autumn in Azerbaijan

However, landslide zones have became more active in Azerbaijan since October, because of a drought in the summer months, and emergence of new cracks in the earth's surface and heavy rainfall In November, prolonged rains have triggered several landslides in the southern region of the country.

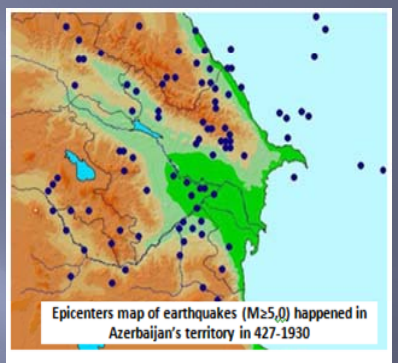


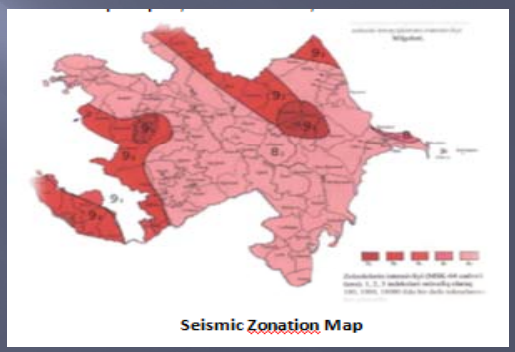
Landslide map of Azerbaijan Republic

## Disaster Profile of Azerbaijan Republic (Seismicity)

As a part of the Alpine folded system Azerbaijan territory characterized as very high seismic activity.

Azerbaijan lies in a region with moderate to very high seismic hazard. A magnitude 6.3 earthquake in the Baku region in November 2000 killed 31 people, affected 3,294 others and incurred a reported economic loss of $10 million.


Epicenters map of earthquakes (M≥5,0) happened in Azerbaijan's territory in 427-1930



Seismic Zonation Map

# Disaster Profile of Azerbaijan Republic (Mud volcanoes and drought areas)

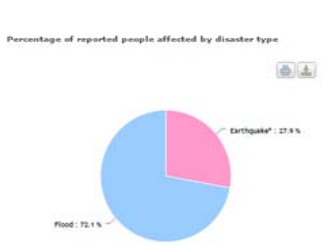
Mud volcanoes are spreading within the Republic of Azerbaijan. There are over 220 mud volcanoes in Azerbaijan (Absheron Peninsula, Gobustan, southeast Shirvan plain, Samur-Davachi plain terrane, both Absheron and Baku Archipelago. Their height varies in the range from 20 to 400m. Besides onshore mud volcanoes there are buried volcanoes and offshore mud volcanoes. There are over 140 offshore mud volcanoes within the Caspian Sea.

Drought is a natural climatic feature of the region and occurs time by time in specific periods. Azerbaijan has been severely affected by the drought that has stricken many countries in Central Asia, the Near East and parts of Europe during the spring 2000. The most affected farmers were those cultivating plots located at the tail end of irrigation canals. The fisheries sector has also been severely affected by the low water levels in the rivers and reservoirs due to the drought.

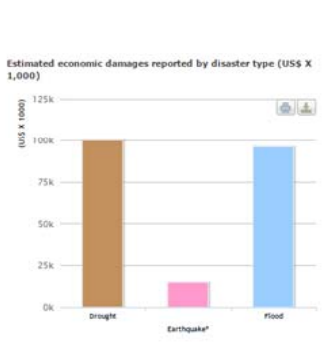

In Azerbaijan 3 mln. ha are exposed to desertinisation out of which anthropogenic desertisation amounts 12 thousand km$^2$ mostly due to demolition of incorrect irrigation system

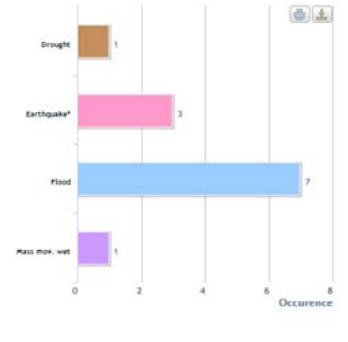
# Disaster Statistics of Azerbaijan Republic for last 20 years

**Disaster Statistics of Azerbaijan Republic**








| Disaster | Date | Affected | Killed |
|---|---|---|---|
| Flood | 1995 | 1,650,000 | 0 |
| Earthquake | 1998 | 700,000 | 1 |
| Flood | 1997 | 75,000 | 11 |
| Flood | 2010 | 70,000 | 3 |
| Flood | 2003 | 31,500 | 0 |
| Earthquake | 1999 | 9,170 | 1 |
| Flood | 1995 | 6000 | 0 |
| Flood | 2009 | 5000 | 0 |
| Earthquake | 2000 | 3294 | 31 |
| Flood | 1995 | 2800 | 5 |

Statistic of Affected and Killed People

# Economic Losses of Azerbaijan Republic due to Disasters

## Disaster Related Economic Losses of Azerbaijan Republic

### Economic Damages

| | |
|---|---|
| Drought: | 100,000.00 |
| Earthquake*: | 5,000.00 |
| Epidemic: | ... |
| Extreme temp: | ... |
| Flood: | 13,742.86 |
| Insect infestation: | ... |
| Mass mov. dry: | ... |
| Mass mov. wet: | ... |
| Volcano: | ... |
| Storm: | ... |
| Wildfire: | ... |

### Economic Damages

| Disaster | Date | Cost (US$ X 1,000) |
|---|---|---|
| Drought | 2000 | 100,000 |
| Flood | 2003 | 55,000 |
| Flood | 1997 | 25,000 |
| Earthquake* | 2000 | 10,000 |
| Flood | 1995 | 6,700 |
| Flood | 1995 | 5,500 |
| Earthquake* | 1999 | 5,000 |
| Flood | 1995 | 4,000 |
| Mass mov. wet | 2000 | 0 |
| Flood | 2009 | 0 |

### Statistics By Disasters Type

Percentage of reported people killed by disaster type


### Statistics Per Event

#### Killed People

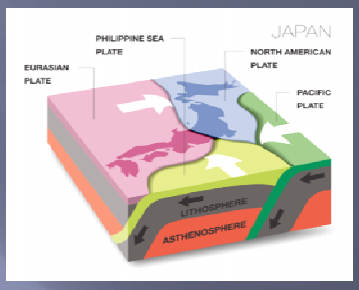
| | |
|---|---|
| Drought: | ... |
| Earthquake*: | 11.00 |
| Epidemic: | ... |
| Extreme temp: | ... |
| Flood: | 2.71 |
| Insect infestation: | ... |
| Mass mov. dry: | ... |
| Mass mov. wet: | 11.00 |
| Volcano: | ... |
| Storm: | ... |
| Wildfire: | ... |

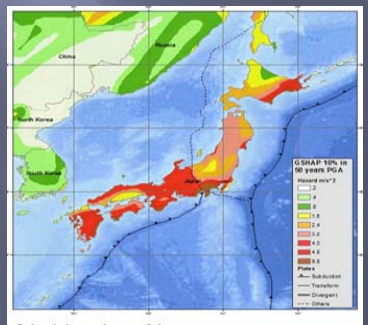
#### Affected People

| | |
|---|---|
| Drought: | ... |
| Earthquake*: | 237,491.33 |
| Epidemic: | ... |
| Extreme temp: | ... |
| Flood: | 262,900.00 |
| Insect infestation: | ... |
| Mass mov. dry: | ... |
| Mass mov. wet: | ... |
| Volcano: | ... |
| Storm: | ... |
| Wildfire: | ... |

# Disaster Profile of Japan

**Unfavorable geographical, topographical and meteorological conditions of the country have made it one of the most disaster prone countries in the world. Although its territory accounts merely for the 0,25 % of the planet's land area, Japan is subject to about 20,5 % earthquakes with the magnitude 6 or more and 7 % the world's active volcanoes is located on its territory. The most frequent natural hazards in Japan are earthquakes, tsunamis, typhoons, volcano eruptions, floods and landslides. Occasional torrential rains and heavy snows are another challenge for the country. The high number of earthquakes, tsunamis and active volcanoes are the conditioned by the fact that territory of Japan forms the part Circum-Pacific Seismic Belt which is sometimes called as Pacific Ring of Fire. Japan located at the junction of 4 tectonic plates- *Eurasian Plate, North American Plate, Pacific Plate and Philippine Sea* –which is the cause of high seismicity of its territory. Tsunamis are triggered by strong earthquakes at ocean bottom or huge landslides in the vicinity of the coast.**



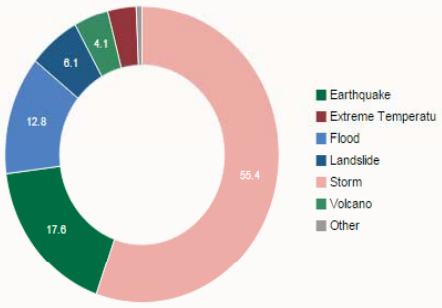
Seismic hazard map of Japan

# Disaster Profile of Japan

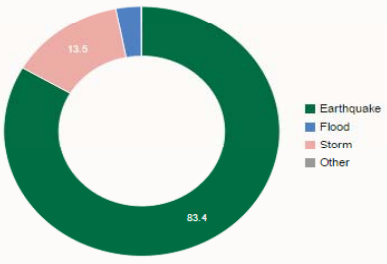
Rivers in Japan are short and steep and flow rapidly and violently. A great amount of rain falls on the Japanese archipelago during the rainy season (heavy rains of June and July) and typhoon seasons; and during periods of intensive rainfall, even a small stream that usually runs low may become a raging torrent. Moreover, combination of such factors as steep mountains, fast-flowing rivers, unstable and soft ground, rainy climate and frequent earthquakes often lead to such sediment disasters as debris flows, landslides and slope failures.

# Disaster Statistic of Japan( Internationally reported losses 1990-2014

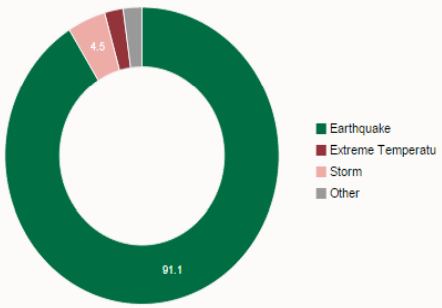
**Frequency**




**Economic issues**




**Mortality**




| 10-year moving average 2005-2014 | |
|---|---|
| Events | 6 |
| Deaths | 2133 |
| Economic loss (,000 US$) | 23,995,660 |

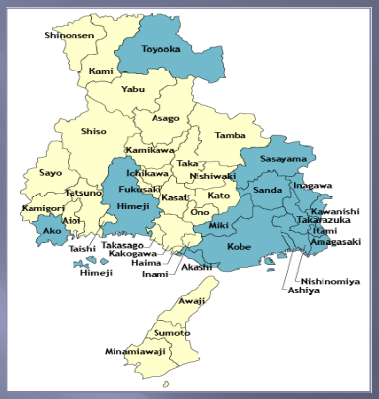
**Probabilistic risk results**

Average Annual Loss (AAL) by hazard

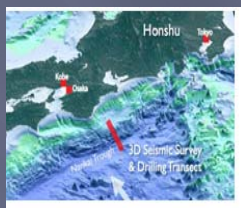
| Hazard | Absolute [Million US$] | Capital stock [%] | GFCF [%] | Social exp [%] | Total Reserves [%] | Gross Savings [%] |
|---|---|---|---|---|---|---|
| Earthquake | 31,857.11 | 0.081 | 3.077 | 2.475 | 2.575 | 2.452 |
| Wind | 4,533.35 | 0.012 | 0.438 | 0.352 | 0.366 | 0.349 |
| Storm Surge | 17,812.27 | 0.045 | 1.721 | 1.384 | 1.440 | 1.371 |
| Tsunami | 2,997.17 | 0.008 | 0.290 | 0.233 | 0.242 | 0.231 |
| Flood | 4,328.15 | 0.011 | 0.418 | 0.336 | 0.350 | 0.333 |
| Volcano | 11,249.01 | 0.029 | 1.087 | 0.874 | 0.909 | 0.866 |
| Multi-Hazard | 61,528.05 | 0.157 | 5.943 | 4.781 | 4.973 | 4.735 |

## Hyogo Prefecture Disaster Profile

With the territory of 8,396 km² Hyogo prefecture has the population of 5,595,052 (for the March 2011). The very peculiar for this region hazards types are followings: Earthquake, Flood, Land Slide, Storm Surge, and Tsunami




| Disaster | Death | Injured |
|---|---|---|
| Southern Hyogo Earthquake (January 1995) | 6,402 | 40,092 |
| Heavy rain caused by the seasonal rain front (July 1938) | 731 | 1,463 |
| Typhoon Muroto (September 1934) | 281 | 1,523 |




Earthquake originating from the Yamaki Fault and the Nankai Trough

Flooding incurred by heavy rain due to the seasonal rain front and typhoons

Landslide disasters in mountainous areas including Mt. Rokko

## LEGAL FRAMEWORK FOR DISASTER MANAGEMENT REGULATIONS IN JAPAN

Disaster Management System in Japan, 3 laws has been enacted to regulate disaster response activities at national level: 1) Disaster Relief Act - 1947 year 2) Fire Services Act -1948 year 3) Flood Control Act – 1949 year - the numbers of the laws regulating other phases of disaster management are following: 7 Basic Acts; 18 with regard to Disaster Prevention and Preparedness; 23 Disaster Recovery and Reconstruction and Financial Measures .

Adopted in 1961 the Disaster Countermeasures Basic Act (DCBA) is considered to be the turning point in the history of modern disaster management system of Japan, The DCBA covers all phases of disaster management and stipulates establishment of disaster management councils at three levels: national – Central Disaster Management Council; Prefectural – Local Disaster Management Council and Municipal Disaster Management Councils as well as defines organization and duties of these councils and defines conditions for establishment of headquarters for disaster control in case of emergency

Disaster Relief Act – The purpose of the law is to provide essential emergency relief in the event of a disaster through the cooperation of local governments, non-governmental organizations, such as the Japanese Red Cross Society, and the general public, so as to protect the disaster victims and maintain social order.

# LEGAL FRAMEWORK FOR RIVER AND FLOOD MANAGEMENT OF JAPAN

River and Flood Management in Japan is regulated based on the **River Act and Flood Control Act** respectively. The River Act, besides setting the basic rules for river administration defines major flood prevention measures whereas the purpose of the Flood Control Act, aka, Flood Fighting Law is to watch for and guard against water-related disasters caused by floods or storm surges and mitigate damage in order to maintain public safety. According to the River Act, the rivers in Japan are classified into 2 groups: Class A and Class B. And also there are independent rivers which are managed either by municipalities or cities
In the event that a disaster has occurred or is likely to occur because of a flood, storm surge, etc. and it is deemed necessary in order to prevent or mitigate such disaster, the Minister of Land, Infrastructure, Transport and Tourism may direct the prefectural governor who performs part of the management of a Class A river in a designated section or the management of a Class B river to take necessary measures.

Flood fighting and preparedness are regulated under the **Flood Fighting Act and Specified Urban River Inundation Prevention Act**.

According to Flood Control Act the municipalities assumes the primary and full responsibility for flood fighting activities within their respective territories. The following flood mitigation measures are conducted based on the **Flood Control Act**:

- Patrol of river,
- Mobilization of flood-fighting and fire-fighting organizations,
- Ordering residents to evacuate,
- Reporting and publishing water levels and reporting levee breaches

The Act plays an important role in the reduction of flood damage. It has provisions governing the following matters.

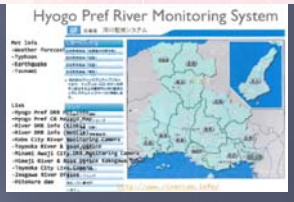
1. Flood forecast to guide evacuation, etc. (jointly issued by a river administrator and the Japan Meteorological Agency).
2. Flood fighting warning to guide flood fighting activities (issued by a river administrator).
3. Public announcement by a river administrator of flood prone areas along each major river and preparation of a hazard map by each municipality based on the assumed flood prone are

# River Management of Japan

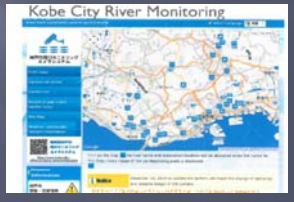
Classifications of rivers in Japan

| Class | River System | River | Length (km) | Management |
|---|---|---|---|---|
| Class A | 109 | 14,000 | 10,600<br>77,400 | MLIT Minister<br>Pref Governor |
| Class B | 2700+ | 7,000 | 35,800 | Pref Governor |
| Class C | | 14,500 | 20,400 | Municipal Mayor |

According to law some of some of Class A and Class B rivers are monitored by Hyogo Prefecture Land Management Bureau Public Works Department River




Class C rivers are monitored and measured by Municipalities




Class A rivers are measured and monitored by Ministry of Land, Infrastructure, Transport and Tourism

## Natural disasters and implementation of laws

In Japan, the disaster management system has been developed and strengthened following the bitter experiences of large-scale disasters and accidents

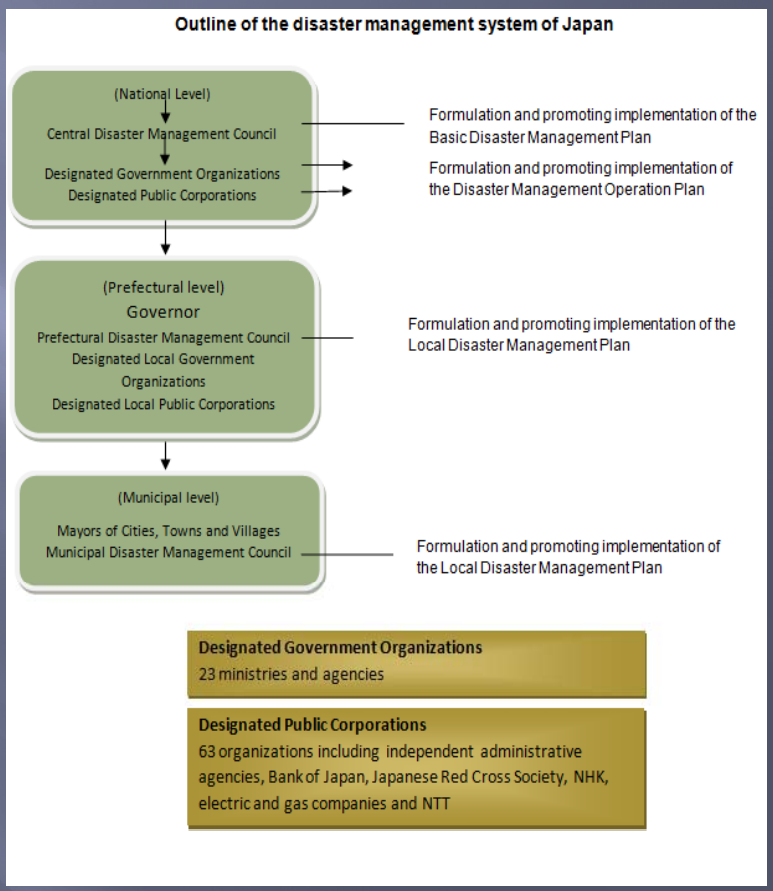
| | EVENT | Disaster Management Acts | Disaster Management Plans and Systems |
|---|---|---|---|
| 1940 | 45-Typhoon Makurazaki<br>46-Nankai Earthquake<br>47-Typhoon Catharine<br>48-Fukui Earthquake | 47-Disaster Relief Act<br>49- Flood Control Act | |
| 1950 | 59-Typhoon Ise-wan | 50-Building standard Law | |
| 1960 | 61-Heavy snowfalls<br>64-Niaagata earthquake | 60-Soil Conservation and Flood Control Urgent Measures Act,<br>61- Disaster Countermeasures Basic Act<br>62- Act on Special Financial Support to Deal with Extremely Severe Disasters<br>62-Act on Special Measures for Heavy Snowfall Areas<br>66-Act on Earthquake Insurance | 61-designation of Disaster Reduction Day<br>62 - Establishment of Central Disaster Management Council<br>63- Basic disaster management plan |
| 1970 | 73-Mt. Sakurajima Eruption<br>Mt. Asama Eruption<br>76-seismological Society of japan's of possibility of Tokai Earthquake<br>78-Miyagi-ken-oki Earthquake | 73-Act on Special Measures for Active Volcanos<br>78-Act on Special Measures for Large-Scale Earthquakes | 79-Tokai Earthquake Countermeasures Basic Plan |
| 1980 | | 80-Acts on Special Financial measures for Urgent Earthquake Countermeasure Improvement Projects in Areas for Intensified Measures<br>81-Amendment of Building Standard Law | 83-Designation of disaster Reduction Week Campaign |
| 1990 | 95-Great Hanshin-Awaji Earthquake<br>99- Torrential Rains in Hiroshima<br>JCO Nuclear Accident | 95- Act on Special measures for Disaster Countermeasures<br>Act on Promotion of the Earthquake – proof Retrofit of buildings<br>Amendment of act on special Measures for large-Scale Earthquakes<br>96-Act on special measures preservation of rights and profits of the victims of specified disasters<br>97- Act on Promotion of disasters Resilience Improvement in densely inhabited areas<br>98- Act on Support for Livelyhood recovery of Disaster Victims<br>99- Act on Special Measures for Nuclear disasters | 95-Amendment of basic Disaster Management Plan Designation of Disaster Reduction and Volunteer Day |
| 2000 | 00-Torrential Rains in the Tokai region<br>04-Niigata-Fukushima Torrential Rains<br>04-Niigata-ken-Chuetsu Earthquake | 00-Act on Promotion of sediment Disaster Countermeasures for sediment Disaster Prone Areas<br>01-Amendment of Flood Control Act<br>02-Act on special measures for promotion of Tohnankai and nankai Earthquakes Disaster management<br>03-Specified urban river Inundation Countermeasures Act<br>04 – Act on Special measures for Promotion of Disaster Management for Trenchtype Earthquakes in the vicinity of the Japan and Chishima Trenches<br>05-Amendment of Flood control Act<br>Amendment of Act on Promotion of sediment Disaster<br>Amendment of Act on Promotion of the Earthquake –proof Retrofit of Buildings<br>06- Amendment of Act on the Regulation of Residential land development | 01-Establishment of Cabinet Office<br>02-Polloy Framework for Tokai Earthquake Polloy<br>Tokai Earthquake Countermeasures Basic Plan<br>04-Tonankai and Nankai Earthquake Countermeasures Basic Plan<br>06-Tokai Earthquake Disaster reduction strategy I<br>Tonankai and Nankai Earthquake Disaster Reduction Strategy<br>Polloy Framework for Tokyo Inland Earthquakes<br>04-Polloy Framework for Trench-type Earthquakes in the vicinity of the Japan and Chishima Trenches<br>Tokyo Inland Earthquake Disaster Reduction Strategy<br>Basic framework for promoting a Nationwide Movement for disaster Reduction<br>05- Disaster Management strategy for trench-type Earthquakes in the Vicinity of Japan and Chishima trenches<br>09- Chubu and Kinki regions inland Earthquake Countermeasures Basic plan |
| 2010 | 11-Great East Japan earthquake | 13 -Amendment of Disaster Countermeasures Basic Act (June 2013)<br>13- Act on Reconstruction from Large-Scale Disasters (June 2013) | 14 - Amendment to Basic Disaster Management Plan |

## Outline of Disaster Management system of Japan and Disaster Management Planning

Disaster management in Japan consists of 3-layered system – national, prefectural and municipal layers.

According to DCBA Disaster Management Councils are established at each level and each council is responsible for the implementation of all disaster management related issues under its authority. Disaster Management

Councils established at each level and each council is responsible for the implementation of all disaster management related issues under its authority

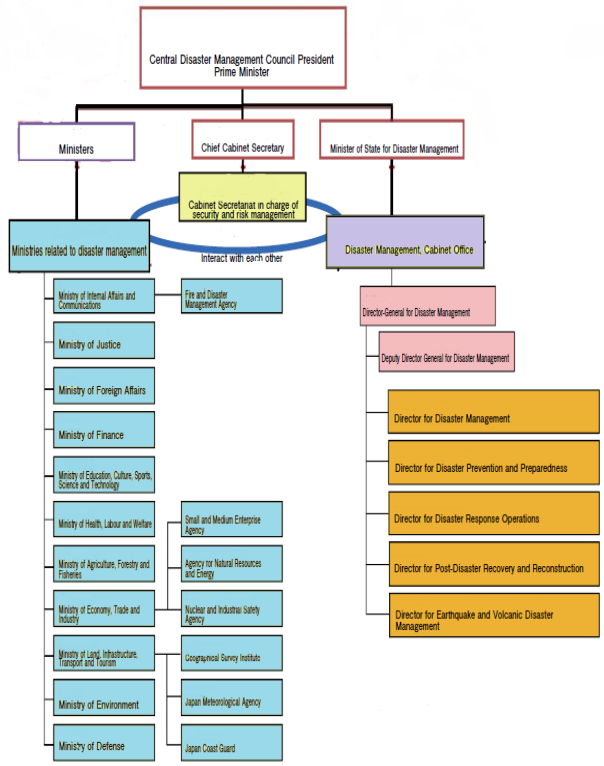


**Central Disaster Management** Council consists of the prime minister, who is the chairperson, Minister of State for Disaster Management , all ministers, heads of major public institutions and experts.. The Council's functions include the following:

* Create and promote the implementation of the Basic Disaster Management Plan
* Create and promote the implementation of plans for emergency measures in the event of a disaster
* Deliberate important matters related to disaster preparedness in response to inquiries from the Prime Minister or Minister of State for Disaster Management (basic policies on disaster management, overall coordination of disaster management measures, proclaiming emergency situation and others), etc.
* Provide full report on important items concerning disaster management to the Prime Minister and Minister of State for Disaster Management

Mission of **Cabinet Office** - Along with a series of reforms of the central government system in 2001, the post of Minister of State for Disaster Management was newly established to integrate and coordinate disaster reduction policies and measures of ministries and agencies. In the Cabinet Office, which is responsible for securing cooperation and collaboration among related government organizations in wide-ranging issues, the Director-General for Disaster Management is mandated to undertake basic disaster management policies and response to large-scale disasters, as well as conduct overall coordination.

Organization of National Government and Cabinet Office (Disaster Management)




## Disaster Management Planning and actors of disaster management system

Disaster management planning in Japan is implemented at three levels:

1. ***Basic Disaster Management Plan*** is prepared by the Central Disaster Management Council and basis plan for disaster management activities. The plan must be based on Disaster Countermeasure Basic Act. The structure of it is as shown in the figure below:
2. ***Disaster Management Operation Plan*** is made by each designated government organization and designated public corporation based on the Basic Disaster Management Plan and should provide measures to be undertaken for disaster prevention pertaining to the business of a designated administrative organ
3. ***Local Disaster Management Plan (prefectural, city, town or village)*** is made by prefectural and municipal disaster management councils, subject to local circumstances and based on Basic Disaster Management Plan.

Disaster Countermeasures Basic Act outlines the main actors of disaster management system of the country

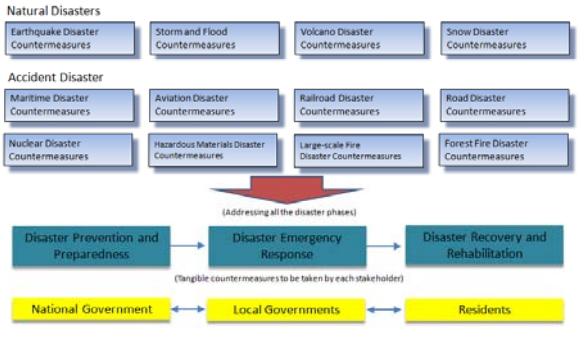
Designated administrative organs which mean administrative organs of the State defined under the National Government Organization Act (Act No. 120, 1948) and which to be designated by the Prime Minister.

Designated local administrative organs means branch offices of designated administrative organs in the prefectures and other local administrative organs of the State designated by the Prime Minister.

Designated public corporations means public corporations such as Nippon Telegraph and Telephone (NTT), the Bank of Japan, the Japanese Red Cross Society, Nippon Hoso Kyokai (NHK) and other corporations engaged in power, gas, transportation, communication and other public utility work, all designated by the Prime Minister.

Designated local public corporations means administrators of other public corporations operating in the area of a prefecture and engaged in power, gas, transportation, communication and other public utility work, all designated by the governor of the prefecture concerned.

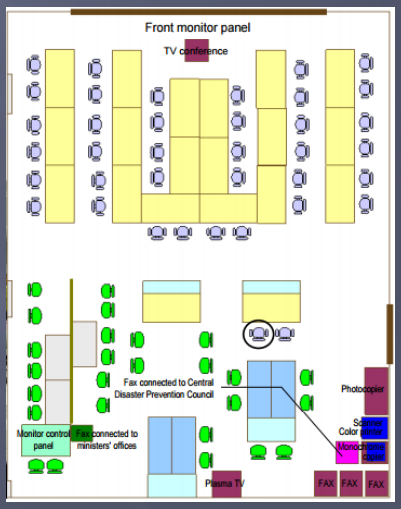
Structure of Basic Disaster Management Plan



## THE MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM

The **MLIT** conducts disaster management policy at national as well as prefectural level in relation to flood and sediment disasters as well as town development with regard to safety for both natural and technological disasters. Alongside with other phases of emergency management the ministry also actively involved in response phase and to this end **Disaster Prevention Center** was established. Disaster Prevention Center established in the MLIT performs the following functions

- Mobilizing leaders, staff members and related department members
- Observing and distributing meteorological information, site images, etc.
- Collecting and sharing information (integrating damage information)
- Exchanging information with ministers' offices, other ministries and agencies, local departments, etc.
- Providing information to the public
- Regional assistance, assistance to local governments
- In case of the large-scale disasters MLIT renders assistance to local governments


Disaster Prevention Center

## Disaster response by THE MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM

### ◆ Assistance process flow

Prevention of further spread of damage in the affected area and early restoration and recovery → Timely and effective support and assistance to local governments, etc. → Dissemination of information on options for support and assistance to local governments, etc., in the affected area

### ◆ Assistance options

| | |
|---|---|
| ①Providing images, maps, information, etc. (e.g., providing images of the affected area) | ⑤Shelters, relief goods, etc. (e.g., providing shelters, using "Michi no Eki" (stopovers along national roads)) |
| ②Risk evaluation, etc. (e.g., inspection of mass movement risk sites) | ⑥Housing (e.g., assistance for the construction of temporary housing) |
| ③Damage survey (e.g., assistance for damage surveys, disaster prevention expert assistance for surveys) | ⑦Post-disaster restoration (e.g., technical assistance for post-disaster restoration) |
| ④Support (e.g., lending emergency vehicles, dispatching experts) | ⑧Recovery (e.g., assistance for recovery planning, assistance for tourism campaigns) |

Adopted by MLIT's disaster prevention council on June 27, 2005

### ◆ Currently available emergency resources

Mobile command vehicle


Emergency helicopter


Satellite communications vehicle


Mobile lighting system


Portable image transmission system: Ku-sat

In order to minimize victims to the less possible extent, **flood forecast centers** (provisional name) have been established in regional development bureaus to improve risk management measures in, for example, monitoring floods and providing information to municipal governments, the mass media, etc. Flood forecast centers are to perform such tasks as climate change monitoring, flood risk evaluation and the development of an advanced flood prediction system. To the end following activities are implemented:

**Collection of point data** (e.g. rainfall amounts, water levels and water quality)

***Rain observation by ground gauges*** and ***telemetry system*** – the data obtained by telemeters are consolidated in one site, such as a regional bureau and a prefectural office, through the linking station. Then, they are sent to each office to update the real-time flood prediction calculations.

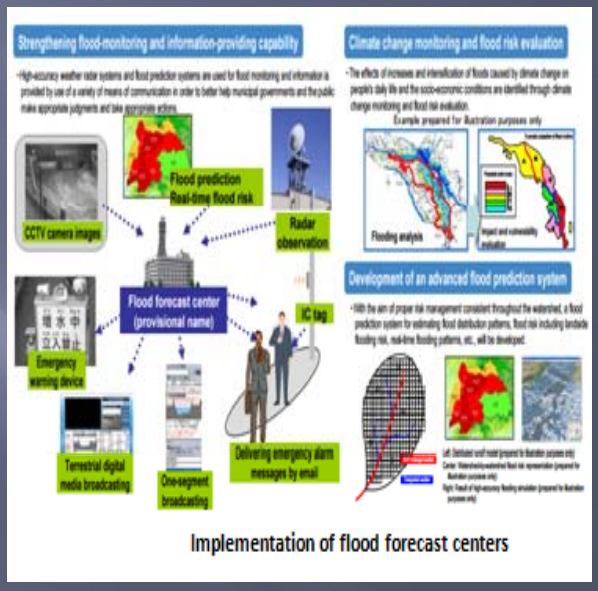
- **Collection of area data** (rainfall amounts)

***Radar rain gauges*** have been installed at 26 locations throughout the country. The information of 1-km mesh resolution is updated every half an hour and available on the Internet.

- **Collection of image data**.

***CCTV Network*** - Ministry of Land, Infrastructure and Transport, Regional Development Bureaus and River Offices have real-time access to 3,900 CCTV images available on IP (Internet protocol) network. CCTV images are used for developing disaster control plans.

River information systems developed by individual regional development bureaus have been integrated into a national river information system. Regional development bureaus can customize the system according to their requirements.



Implementation of flood forecast centers

## JAPAN METEOROLOCICAL AGENCY

JMA is semi-autonomous agency of the MLIT. Besides, function as central weather service agency of Japan, the agency has established comprehensive surveillance and awareness providing mechanism with regard to earthquake, typhoon and volcano hazards.

### Weather Analysis and Prediction

JMA monitors weather conditions 24 hours a day and issues Emergency Warnings, Warnings and Advisories to mitigate the effects of possible natural disasters and allow preparations for other disasters they may trigger. The Agency also issues weather forecasts based on observation and numerical weather prediction (NMP)

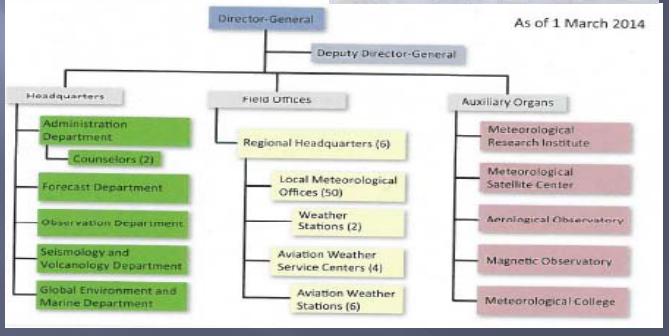
### Numerical Weather Prediction

Future weather is predicted by calculating using a numerical weather prediction model on a supercomputer.

### Weather maps and Monitoring

Forecasters use various weather maps to determine future weather conditions and monitor changes in weather conditions such as torrential rain, tornadoes and thunderstorms.


JMA's Headquarters



## JAPAN METEOROLOCICAL AGENCY

| | |
|---|---|
| Emergency Warnings: | Storm, Snow-storm, Heavy rain, Heavy snow, Storm surge and High waves |
| Warnings: | Storm, Snow-storm, Heavy rain, Heavy snow, Storm surge, High waves and Flood |
| Advisories: | Gale and snow, Gale, Heavy rain, Heavy snow, Dense fog, Thunderstorm, Dry air, Avalanche, Ice/Snow accretion, Frost, Low temperature, Snow-melting, Storm surge, High waves and Flood |

### Information for Severe Weather Preparedness

JMA issues messages in order to mitigate possible issues such as damage from storm/flooding, debris flow and slope failure caused by tropical or extra-tropical cyclones and fronts. The messages issue as:

### Emergency Warnings/Warnings/ Advisories

### Bulletins/ Bulletins on Exceptionally Heavy Downpours

Bulletins are issued to alert the public to weather conditions before Warning/Advisories are issued.

### Flood Warnings and Advisories for designated rivers

JMA issues Flood warnings and Advisories for designated rivers with information on water levels or flow rates in collaboration with national and prefectural river authorities

Along with above mentioned messages JMA issues **Hazardous Wind Watch, Information on debris flow, slope failure and other hazards, Radar/ Raingauge-Analyzed Precipitation and Very-Short Range Forecasts of Precipitation and Newscasts (Precipitation, Thunder and Tornado)**

### Observation Network of JMA

JMA operates an array of networks involving surface based observation and the use of meteorological satellites to monitor the atmosphere around the clock. The results are made available to the public and related users.

### Upper-air observation

Upper-air observation is performed via radiosonde and wind prolifer observation networks

### Satellite Observation

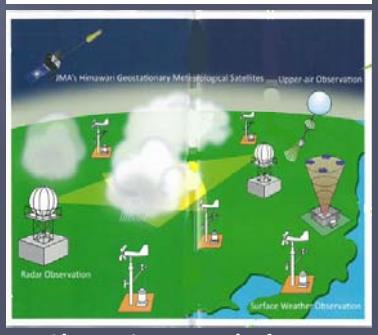
Obtain the clear picture of typhoons over ocean areas and other global atmospheric conditions

### Radar observation

20 Doppler weather radars are used to observe rainfall/snowfall intensity nationwide altogether with providing the information on the movement of thunderclouds

### Surface weather Observation

A total of 160 JMA weather stations, including Local Meteorological Offices , across the country routinely collect data on variables such as surface pressure, temperature, humidity, wind, precipitation, sunshine duration, snow depth visibility and current weather conditions


Observation Network of JMA

## Activity of JMA

### Monitoring of the Global Environment

JMA carries out observation and monitoring to environmental issues such as global warming and ozone layer depletion as well as prediction of global warming, and makes the result public.

**JMA monitors:**

- Along with Japan's Ministry of Defense observe greenhouse gases in seawater
- Extreme climate events around the world and related phenomena such as El Nino and La Nina
- Atmospheric environment
- The oceans ( water temperature, salinity, carbon dioxide)
- Global environment observation network


Global environment observation network

### Meteorological Information for Aviation and Maritime Safety

- JMA provides aviation and maritime operators with specialized information to meet their specific needs. It includes
- Monitoring at Aerodromes
- Monitoring of Airspace
- Issuance of Marine Warnings and Wave Forecast Charts

### Monitoring of Earthquakes, Tsunamis and Volcanoes

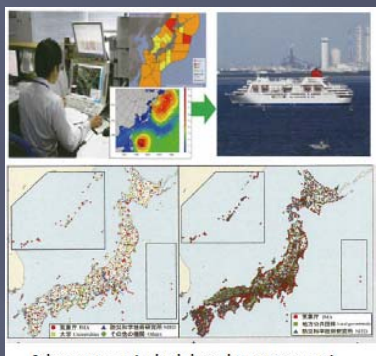
JMA monitors real-time data from around 1,500 seismometers and around 4,300 seismic intensity meters, tsunami observation facilities (around 80 tide gauges and 36 offshore-water-pressure gauges) and instruments such as seismometers, tiltmeters, GPS and other tools installed near 110 active volcanoes around the clock and issue a range of disasters mitigation information.

JMA provides daily forecasts/one-week forecasts (information on weather, winds, coastal ocean waves, maximum/minimum temperatures and probabilities of precipitation) covering periods up to two days /up to seven days ahead. They include Distribution Forecasts and Three-Hours Forecasts.

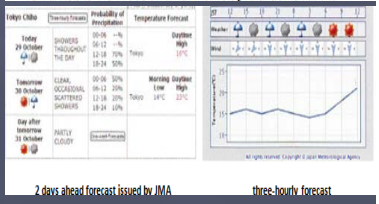
**Seasonal Forecasts** (average temperature, precipitation amounts, sunshine durations and snowfall) totals for the next one to several months are also provided by JMA

### Early Warning Information on Extreme Weather

JMA issues Early Warning Information on Extreme Weather every Monday and Thursday when a high probability of extreme seven-day average temperatures or very heavy snowfall is predicted



Seismometer and seismic intensity meter network



2 days ahead forecast issued by JMA

three-hourly forecast

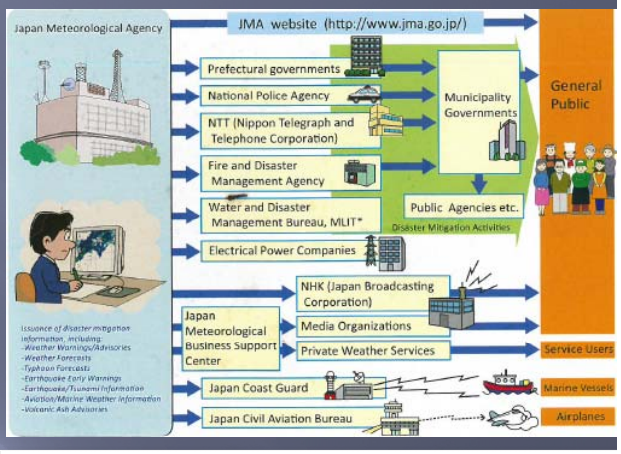
## Interaction of JMA with other organization in disaster management area

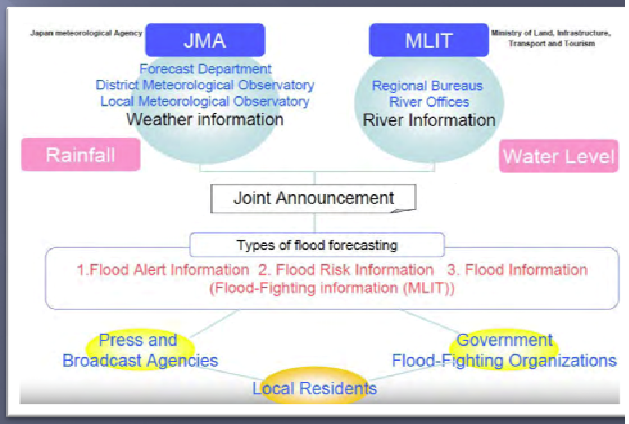
**In order to limit the extent of damage caused by natural disasters and support the prompt execution of related activities, JMA provides disaster mitigation information through various channels to government disaster management agencies, local governments, the media and the public. JMA often provide the disaster mitigation information along with other governmental body (MLIT).**

**MLIT informs, jointly with the Director-General of JMA, for a class A river (excluding designated sections), the prefectural governors concerned**

- **water level or discharge if the possibility of flooding is deemed high or**
- **water level or discharge, or the flood hazard area and the flood water depth if flooding has already occurred.**

**It is JMA which designed and apply Earthquake Early Warning System after the Great Hanshin-Awaji Earthquake. EEW provide advance notice of estimated seismic intensities and expected arrival times of principal motion just after an earthquake occurs**




# Earthquake Early Warning of JMA

Earthquake

A matter of seconds

### Earthquake Early Warnings

Earthquake Early Warnings (EEWs) provide advance notice of estimated seismic intensities and expected arrival times of principal motion just after an earthquake occurs. If the estimated maximum seismic intensity is 5-lower or more, EEWs (warnings) are issued for regions with estimated seismic intensities of 4 or more.


Stay calm and keep safe!

1.5 to 2 minutes

### Seismic Intensity Information

This information specifies the time of earthquake occurrence and identifies regions where seismic intensity levels of 3 or greater have been observed (issued within 90 seconds of the earthquake).

2 to 3 minutes

### Tsunami Warning/Advisory

When an earthquake occurs, JMA estimates whether a tsunami has been generated. If disastrous waves are expected in coastal regions, a Tsunami Warning/Advisory is issued.

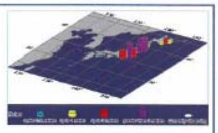
| Category | Indication | Actions to be taken |
|---|---|---|
| Major Tsunami Warning* | Tsunami height is estimated to exceed 3 meters. | Evacuate from coastal or river areas immediately to safer places such as high ground or a tsunami evacuation building. |
| Tsunami Warning | Tsunami height is estimated to be 1 - 3 meters. | |
| Tsunami Advisory | Tsunami height is estimated to be 0.2 - 1 meter. | Get out of the water and leave coastal areas immediately. |

* Major Tsunami Warnings are issued in the classification of Emergency Warnings. → p. 1, 2

Around 5 minutes onward

### Tsunami Information

When a Tsunami Warning/Advisory is issued, JMA also issues Tsunami Information with details such as estimated arrival times/heights and recorded tsunami data.



### Earthquake and Seismic Intensity Information

This information specifies the tremor's hypocenter and magnitude. It also identifies cities/towns/villages where seismic intensity levels of 3 or greater have been observed and those where the estimated seismic intensity is 5-lower or greater but related observation data are incomplete.

### Information on Seismic Intensity for individual locations

This information specifies the tremor's hypocenter and magnitude. It also identifies individual locations where seismic intensity levels of 1 or greater have been observed and those where the estimated seismic intensity is 5-lower or greater but related observation data are incomplete.

### Other Information

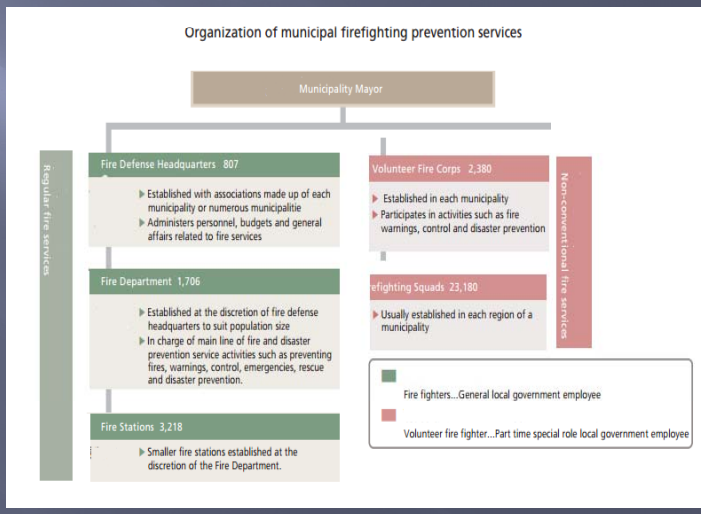
JMA also issues other reports such as Information on Seismic Activity later.

## FIRE AND DISASTER MANAGEMENT AGENCY

**The Fire Defense Organization Law prescribes that the FDMA conducts research, formulates plans, etc, concerning fire service systems in order to strengthen the fire defense capabilities of municipalities. it provides municipalities with advice, guidance and recommendations concerning their fire service organizations and activities. Below are the main affairs under the jurisdiction of the FDMA:**

- ***Planning and formulation of the overall fire service system***
- ***Guidance for and assistance in strengthening fire service facilities***
- ***Research concerning fire service science and technology***
- ***Training for fire service personnel and officers in the volunteer fire corps***
- ***Advice, guidance and recommendations regarding prefectural and municipal fire services***
- ***Requests for assistance measure during an emergency***
- ***Planning, formulation and coordination in relation to disaster prevention measures taken by local governments***

**Firefighting agencies in Japan comprise of regular fire prevention services such as fire defense headquarters and fire department, and the non-conventional volunteer fire corps. Both these organizations are established under the responsibility of regional municipalities that are controlled under the jurisdiction of municipality mayors**


## Volunteer fire corps and Emergency fire response team of FDMA

**Volunteer fire corps operates in every town and city of the country, Every member of the volunteer fire corps has their own regular job, but are active days or night protecting their own town by themselves. While they are involved in firefighting activities, they are also there to protect the lives, physical being and properties of local residents from natural disasters such as earthquakes, wind and water damage through rescue efforts, warning patrols and evacuation guidance. Even when there is no disaster present, volunteer fire corps organizes numerous community-based activities designed to improve fire and disaster prevention capabilities, Female volunteer fire corps participates in areas that have been predominantly female-oriented, including home visits to early people for fire prevention, and holding fire prevention classes at kindergartens and elementary schools.**

**The FDMA works with local disaster prevention groups such as voluntary disaster prevention organizations and in-house fire fighting team of companies for the promotion of initiatives that contribute to the local community. These include improving the quality of personnel serving to prevent disasters in regional areas, rejuvenating voluntary disaster prevention organizations and enhance danger management training, and increasing disaster prevention awareness within companies.**

.


Joint emergency drill held by volunteer fire corps and voluntary disaster prevention organizations


Fire prevention patrol


Firefighting under the coordination of fire fighters


Home visits to elderly people


Children learning firefighting techniques


Volunteer fire corps pump competition

# Emergency Fire Response Team of FDMA

Emergency Fire Response Teams was founded in 1995, after the Great Hanshin-Awaji Earthquake and institutionalized by the Fire Defense Organization Law.

Emergency Fire Response Team of FDMA operates in the case of large-scale disasters when firefighting organizations cannot cope alone, EFRT is elite emergency rescue teams of the FDMA, It supervise municipal teams and manage their activities and in case of necessity deploys teams swiftly to disaster areas using helicopters and other vehicles in order to gain a better understanding of disaster conditions, contacting and liaising with the Fire and Disaster Management Agency, and providing instructions and support to local firefighting teams. Since 2004 The Team's Head has the authority to mobilize and control firefighting teams in the event of a large-scale disaster or accident. The FDMA controls all aspects of management, from obtaining real-time information on the disaster to instructing Emergency Fire Response Teams to mobilize. Below the structure of Emergency Response Fire Teams is described:

- ✓ Firefighting Teams: Assist in putting out fires to prevent the spread of flames during large-scale fires.
- ✓ Rescue Teams: Ensure preparation of equipment used for advanced rescue, search for persons requiring rescuing and assist in rescue efforts.
- ✓ Emergency Teams: Ensure preparation of equipment used for high-level emergencies and assist in emergency activities
- ✓ Logistical Support Teams: Assist in required transport and resupply using vehicles equipped with water supply systems to support the activities of each team.
- ✓ Special Disaster Teams: Firefighting teams for responding to special types of disasters, including poisonous substances and major toxic spills.
- ✓ Special Equipment Teams: Firefighting teams for responding to special equipment, including those required by teams for rescues in flooded areas and carrying water to remote areas.
- ✓ Air Squadrons: Firefighting activities conducted using fire protection helicopters
- ✓ Marine Squadrons: Firefighting activities conducted using fireboats

Rescue activities that firefighting organizations are involved with range from fires, traffic c accidents, flooding and natural disasters, extending to special types of disasters that include terrorist attacks. At the heart of these rescue efforts are Rescue Teams, comprising of experts that have received special education and training on life-saving and rescue techniques, various types of rescue equipment, and rescue vehicles Response Teams assist them

Water Flooding Rescue Effort

Traffic accident rescue efforts

# Japan Coast Guard

Alike the JMA, Japan Coast Guard (the JCG) is the external organ of the MLIT. The main responsibilities of JCG in terms of disaster preparedness and marine search and rescue include:

***Search and Rescue:*** (Rescue from Capsized Vessel, Ice Breaking, Catch by Helicopter, Utilizing the Japanese Ship Reporting System (JASREP))

***Prevention of Accident :*** (Prevention of Marine Leisure Accidents Marine Leisure Events Information Service Room

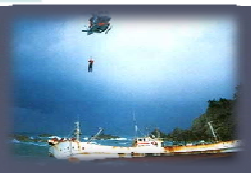
***Protection of Marine Environment:*** (Chase of Oil Discharging Vessel, Fire Fighting Operation for Blazing Tanker, Derelict Ship Countermeasure, Oil Pollution Response

***Disaster preparedness and marine search and rescue*** – it is the responsibility of JCG to conduct search and rescue operation once accident such as boat/vessel involved accidents occur. It responds promptly by deploying of mobile rescue personnel skilled at descending from helicopters and bring people back up, scuba diving, and providing emergency first aid treatment. The JCG also works together with other public and private rescue organizations including police and fire departments to cover the vast areas of sea that surround Japan. It is important that the JCG be notified as soon as possible when trouble occurs in seas far from land. For that reason, the JCG operates a maritime accident reporting service 24 hours a day by radio based on the Global Maritime Distress and Safety System (GMDSS). Reports of incidents and accidents and requests for help can also quickly be made to the JCG when the need arises by dialing 118 on a mobile or onboard phone.

To respond to such maritime disasters as large-scale oil spills, the discharge of hazardous and noxious substances, and shipboard fires, the JCG has stationed fire-fighting ships and disaster mitigation equipment around the country. The JCG also works for maritime disaster prevention by conducting exercises with private-sector disaster prevention organizations in Japan and overseas.


Central and Regional Organization Of JCG

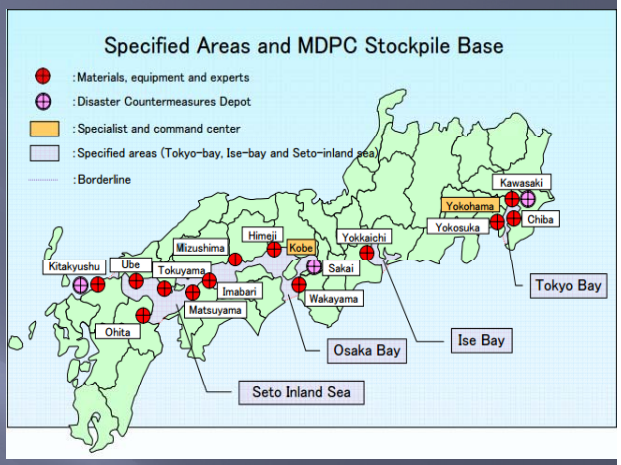
Regional Centers of JCG



## Maritime Disaster Prevention Center

Established in 1976 Maritime Disaster Prevention Center (MDPC) is the only legitimate organization set forth by the Law to carry out prevention and elimination operation to response with any Oils ( crude oil, heavy oil, lubricating oil and etc as well as gasoline, kerosene, light oil, oil refuse and refined products and HNS (Hazardous and Noxious Substances (HNS) includes Non-persistent oil and Noxious liquid substance.) spill incidents, including marine fire fighting, associated with shipboard disasters of HNS tankers along the Japanese coastal line,

In the event that an HNS spill incident actually occurs or is anticipated, MDPC will immediately respond to the incident site at the request of the captain or ships owner, and take initial pollution prevention and elimination measures including putting out the fire or preventing the spread of the fire, or any other actions against potential danger.




# Self Defense Forces

The SDF disaster relief role is defined in Article 83 of the Self-Defense Forces Law of 1954, requiring units to respond to calls for assistance from prefectural governors to aid in fire fighting, earthquake disasters, searches for missing persons, rescues, and reinforcement of embankments and levees in the event of flooding. The SDF conducts a variety of disaster relief operations in collaboration with municipal governments when disasters such as natural disasters occur in any part of the country, by engaging in the search and rescue of disaster victims or missing ships or aircraft, controlling floods, offering medical treatment, preventing epidemics, supplying water, and transporting personnel and goods.


Activities of SDF units in 1995

SDF are deployed only upon the request of prefectural governor. Municipal mayors can ask prefectural governors to request a disaster relief dispatch by the SDF. In the event that mayors are unable to make such a request to the prefectural governor, they can inform the Minister of Defense, or those designated by the Minister of the disaster conditions. After receiving such requests from governors, the Minister of Defense or other personnel designated by the Minister can immediately dispatch units as necessary according to the disaster situation. Under circumstances of particular urgency (from the Kobe earthquake lessons) when there is no time to wait for a request, the Minister of Defense or those designated by the Minister may authorize an exceptional dispatch (discretionary dispatch). However in the 1995 Great Hanshin-Awaji Earthquake, it took a lot of time to dispatch SDF units as governments of Hyogo Prefecture and Kobe City could not collect and analyze damage information.

## MUNICIPAL LEVEL VOLUNTARY EMERGENCY RESPONSE TEAMS
## VOLUNTARY FIREFIGHTING CORPS, SUIBO-DAN – VOLUNTARY FLOOD FIGHTING TEAMS

Likewise the fire departments and stations, volunteer fire corps in Japan also are organized by municipalities. The fire corps are independent from the fire departments and fire stations and there are no top-down relationships between these two. However, in cases of where the fire corps are called out in emergencies, they must follow the orders of the chief of the fire department or fire station. For the volunteer fire corps, the basic rule is one corps in one municipality

**SUIBO-DAN – VOLUNTARY FLOOD FIGHTING TEAMS** - Voluntary flood fighting teams, known as "suibo-dan" play important role in flood fighting system of Japan. These teams are usually established within the municipalities in the vicinity areas of rivers. The members of "suibo-dan" normally engaged in different jobs but are also involved in patrolling, watching out and levee protection works in close coordination with river administrators and other related organizations during floods. During periods without flooding, they still conduct patrols and inspection of levees, provisions for flood fighting warehouses and for communication facilities, drills and other activities in preparation for a flood. As of 2009 there were about 900 000 voluntary flood fighters nationwide.

## (BOKOMI) - Kobe's Community –Based Disaster Prevention Organization

**BOKOMI – BOKOMI are community based - elementary school district based disaster prevention organizations. Since 1995, based on the lessons learned from the Great East Hanshin-Awaji Earthquake, all of the districts of Kobe city – 191 districts have established BOKOMIs. BOKOMI organization comprises of firstly, it local government organizations including the local city office and the local fire station, together with local residents associations, women's associations, elderly associations, voluntary fire corps and etc. The equipment and materials needed for the activities are provided by the local government and storehouses installed in local parks, in preparation for emergencies. In normal times BOKOMI conducts various emergency drill programs such as on how to use the provided equipment and materials (for ex. Water fire extinguishers, powder fire extinguishers), rescue drills, evacuation drills, information transmission drills, flood control drills and etc and conduct school disaster prevention education.**

# DISASTER MEDICAL ASSISTANCE TEAMS

Disaster Medical Assistance Teams are specialized and trained medical aid teams which operate during large-scale disasters. DMAT system was established in 2005 based on the lessons of Great Hanshin Awaji Earthquake. DMATs are defined as "mobile, trained medical teams that can be rapidly deployed during the acute phase of a disaster (within 48 hours). "DMAT Team Member Training Course" is conducted at the National Hospital Organization's Disaster Medical Center (an independent administrative agency) for certification of DMAT personnel. DMAT member are specialized to render medical assistance and treatment during the acute phases of disasters as well as transferring casualties to safe areas.

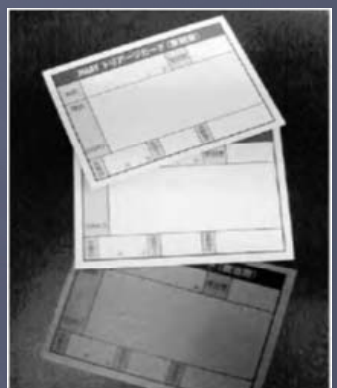
Functioning of DMAT are based on the agreements between prefectural governments and medical establishments and DMATs are deployed only upon the request of government of disaster affected prefecture.


# JAPAN MEDICAL ASSOCIATION TEAMS – JMAT

**Purpose**

- To provide medical assistance at hospitals and clinics in the disaster - affected areas (and to provide the ongoing medical treatment that needed to be continued even before the disaster occurred)
- To provide medical treatment at evacuation sites and first - aid centers.

The physicians write their on-the-spot judgments down on these cards and give to patients in evacuation shelters and other locations so that they can be connected later treatment and used by takeover caregivers. Over 230 such teams are currently organized.



From top) White card: needs observation, Yello
ard: needs attention, Red card: needs treatmen

JMAT Triage tags

**Dispatch of JMAT**

When a disaster strikes, the JMA moves into action to dispatch physicians with various areas of expertise to affected areas along with pharmacists, nurses, other health professionals and administrative staff. Once dispatched, the main activities of JMAT involve providing medical care and health management at first-aid stations and shelters and offering medical assistance for local hospitals and clinics in disaster areas to support the continuation of pre-disaster medical services. JMAT is also responsible for providing public health management at shelters, clarifying medical needs, identifying locations where medical support is not available and making rounds in such areas and so on

**Composition of JMAT**

A JMAT typically consists of one physician, two nurses and one coordinate staff member. However, team composition should be flexible in response to the situations at hand based on staff availability and local needs, both in terms of professions and staff numbers.

## JAPANESE RED CROSS SOCIETY

The JRCS has a well-organized disaster response regime, with 488 response teams throughout the country with 6,844 medical relief personnel registered as standard. Each team consists of six personnel: a doctor, a head nurse, two nurses, and two administrators. The organization is also involved in rescue operations following transportation accidents, such as airplane and train crashes, and industrial disasters, such as gas explosions.

These disaster relief activities are conducted as a mission of the Red Cross under the Japanese Red Cross Law and its statutes. In addition, the JRCS is designated as a "Designated Public Corporation" by the Disaster Countermeasures Basic Act and the Disaster Relief Act, and is required to co-operate with the Government to offer relief assistance in times of disaster. The contents of such assistance are provided for under an agreement with the Minister of Health, Labor and Welfare.

日本赤十字社
Japanese Red Cross Society

The domestic disaster relief activities of the JRCS are as follows:

- Medical relief and psychological care
- Storage and distribution of relief goods
- Provision of blood products
- Collection and distribution of voluntary donations

Activities by Red Cross volunteers include collection of information, first aid, provision of hot meals, tracing services, transportation and distribution of relief goods, and caring for those who evacuate to shelters.

## BUILDING RESEARCH INSTITUTE

The BRI is actively involved in response measures taken in immediate aftermath of earthquakes, as well as in long term measures. As to immediate measures, the BRI conducts preliminary damage assessments of buildings just after an earthquake hit the area thereby defining which buildings is still can be exploited which are not. Having completed assessment of each building BRI specialist attach an special sticker on what enables one to define vulnerability level of a building. The measure helps to avoid future human injury and loss as well as identify possible evacuations spots. As to the long term measures the BRI is main institute who conducts research for building seismic resistant buildings and seismic retrofitting of buildings.


BRI disaster response – building assessment

# NHK – JAPAN BROADCASTING COMPANY

As one of the public corporations designated for disaster management under the Disaster Countermeasure Basic Act, NHK plays the key role in disaster broadcasting and emergency warning. Small quakes detected the JMA before strong earthquake occurs, automatically redirected to NHK within a few seconds, (moreover, NHK has installed seismic intensity meters at 73 locations countrywide) what enables it to issue public alert promptly and provide necessary information regarding the magnitude and precise location of the earthquake as well as tsunami information nationwide. Emergency Warning System (EWS) is carried out only in special emergency cases such as large-scale tsunami and earthquake warnings or based on the request of governors and mayors. In striving to alert as many people as possible, the EWS switches on TV sets and radios – 4 TV channels and 3 radio channels belong to NHK - automatically. The test transmission is conducted every month and emergency drills held every day by NHK. To ensure quick and live broadcasting from disaster hit areas NHK owns 14 helicopters – which are equipped with necessary devices for live broadcasting – stationed at 12 locations and 460 remote controlled cameras installed countrywide. In addition, the official web-page of NHK also provides disaster and weather information and enables watching two channels – General TV and NHK World TV - online.

Tsunami warning broadcasting by NHK

## Case Study: Osaka Gas Engineering Co., Crisis Management System.

Osaka Gas basically has the below **three disaster prevention measures for earthquakes**. Each consists of training and drills with hardware and software.

Emergency measures:

**Seismometer**

In order to determine whether damage has been caused by earthquakes or not and quickly estimate the extent of that damage, gas companies in Japan use seismometers that can measure structural damages of pipeline. The seismometers are tied into an automatic shutoff system that triggers under high earthquake intensity.

**Shut-off system**

**Safety is ensured in areas heavily damaged by earthquakes by stopping city gas supply.**

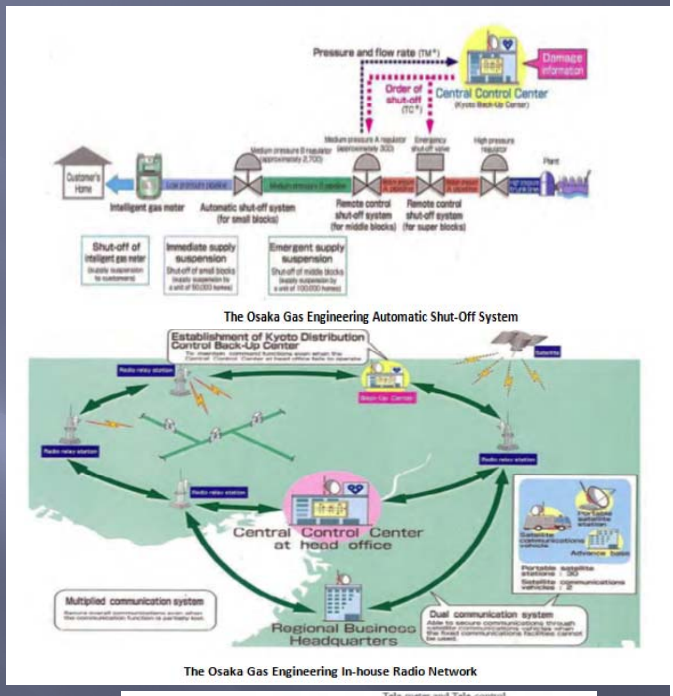
The intelligent gas meters installed at each customer's location automatically shut off at 200 (gal). Furthermore, low pressure gas supply is automatically shut off in earthquakes capable of damaging pipelines and structures by an automatic shut-off system installed at medium pressure governor B. Moreover, in extreme cases (widespread damage), city gas supply can be shut off remotely from the Central Control Center and Back-Up Center.

**In-house radio network**

In order to smoothly produce and supply city gas, Osaka Gas remotely monitors and controls city gas supply 24-hours a day by radio network that works by radio waves and satellite.

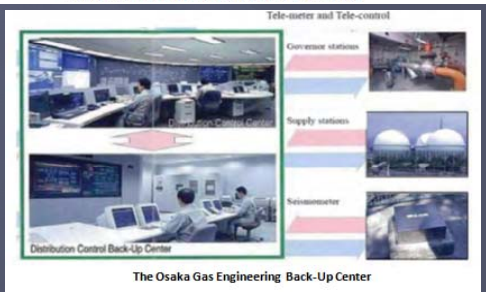
**Back-Up Center**

To ensure customers absolute safety and convenience in their use of city gas, it is necessary to remotely monitor and control city gas supply at all times, and, in the event of an earthquake, collect damage information and operate the system from remote.



The Osaka Gas Engineering Automatic Shut-Off System

The Osaka Gas Engineering In-house Radio Network



The Osaka Gas Engineering Back-Up Center

# INTERNATIONAL EMERGENCY RESPONSE
# JAPAN DISASTER RELIEF TEAM (JDR)

In the case large-scale disaster in foreign countries JDR join emergency relief operations upon the request of the government of the disaster-affected country to the Ministry of Foreign Affairs of Japan. Dispatch is carried out by JICA based on Disaster Relief Team Law within the framework of its Disaster Relief Program.

There are four types of JDR teams. In order to facilitate the rapid supply of relief items they should be procured and appropriately stockpiled in advance at locations as close as possible to disaster areas.

JICA has warehouses in four locations worldwide, namely Germany (Frankfurt), Singapore, the United States (Miami) and South Africa (Johannesburg). Eight priority goods are stockpiled at these four locations—tents, sleeping pads, plastic sheeting (tarpaulins), blankets, portable water containers (plastic jerry cans), water tanks, water purifiers and electric generators.

| Dispatch Team | Composition | Activity | Duration |
|---|---|---|---|
| Search and Rescue Team  | National Police, Fire and Disaster Management, Coast Guard, MOFA, JICA, | Search and rescue victims trapped in collapsed structures | Approx 7 to 10 days |
| Medical Team  | Doctors, nurses, pharmacists Team head (MOFA) Team Coordinator (JICA) | Urgent medical assistance including patient treatment | Approx 2 weeks |
| Expert Team  | Experts provided from 14 related Ministries of Japan | Technical advice or guidance on disaster prevention and damage mitigation based on an assessment of the situation. | Approx 2 weeks |
| Self-Defense Force Unit  | Ground, Maritime, Air Self-Defense forces 50-1000 persons depends on number of dispatched team | Search and rescue, medical assistance (including disease control) Air and sea transport and water supply | Approx 2 weeks to 2 months |

# THE GREAT HANSHIN-AWAJI EARTHQUAKE
## 17 JANUARY , 1995

The Great Hanshin earthquake, or Kobe earthquake or Southern Hyogo Earthquake occurred on Tuesday, January 17, 1995, at 05:46 in the southern part of Hyōgo Prefecture .

The Earthquake had 3 main characteristics that features it

- The earthquake focal point was directly under an urban area
- This quake was recorded at Level 7, the first observed earthquake at this level
- There were big vertical motions in addition to horizontal motions in some areas

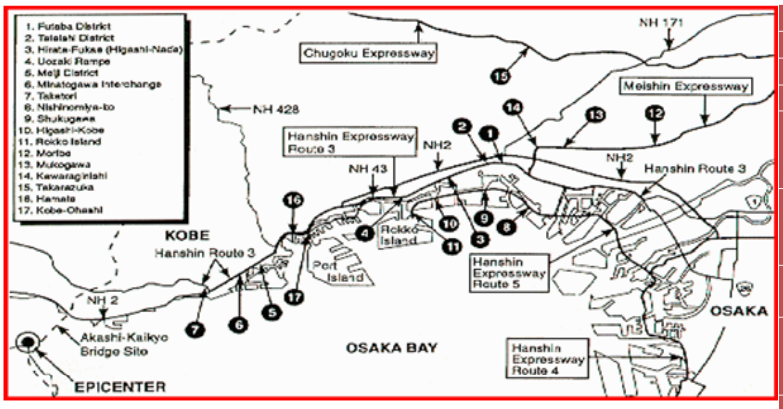
*More than 500, 000 houses and buildings were partially or completely destroyed. The slow start of the search and rescue operations and lack of emergency management increased the human and property damage. The redundancy of the water supply systems and quick recovery of electric power contributed to the stabilization of the regional society in spite of the massive damage.*

*The hypocenter of the earthquake was located about 20km southwest of downtown Kobe City between the northeast tip of Awaji Island and the mainland was focused about 13.2 km under the northeast tip of Awaji Island and had a Japan Meteorological Agency magnitude of 7,2.*

*Kobe area had historically suffered mostly from typhoons and heavy rainfall.* In 1896 , 1903 , 1905 , 1910 , 1932 , 1935 , 1938 , 1945 , 1961 ,and 1967 ,Kobe suffered sediment disaster due to heavy rainfall. The most devastating was that occurred in 1933 during which debris flows that accompanied flood in killed 616 people. Therefore, for the residents and local governments sediment flew had posed a main source threat in terms of disaster in this area. The same does not refer to earthquakes. The organs designated for disaster management in particularly for disaster preparedness and disaster mitigation don't even taken into account the possibility of major earthquake. No emergency management plans had been elaborated during a major earthquake close to this densely populated urban area.

The violent tremor lasted 20 seconds or less, but 101,233 houses were completely destroyed and about the same number semi-destroyed. The old wooden houses with heavy tiled roofs collapsed, blocking the streets and obstructing rescue and relief activities. Reinforced concrete buildings built according to the old construction code were also damaged

*Among the places that suffered the most from the earthquake was Kobe port. Kobe has a 130-year tradition as an international port, and ranks as the sixth largest cargo port in the world, it handled about 40 million tons of international container Damage to the port facilities include the severe collapse of 239 berths, The estimated cost of the damage was 1.4 trillion yen.*




Areas hit by the Great Hanshin -Awaji Earthquake, 17 January, 1995

| Level | Type | Explanation |
|---|---|---|
| 0 | Not felt | Nobody can feel, only a seismometer can record |
| 1 | Tremor | A person at rest or a careful person can feel |
| 2 | Slight | Most people can feel, sliding doors may move |
| 3 | Weak | Houses may tremble, sliding doors make a sound. Hanging things may wave. Anyone can see that the surface of water will ripple |
| 4 | Middle | Houses tremble strongly, something like a flower vase may fall. Water in a container may overflow. Walking people can feel. |
| 5 | Strong | A wall of a house may crack, gravestones may fall and a chimney may be crushed. |
| 6 | Stronger | Under 30% of houses may be crushed, landslides may occur and the ground may fissure. Most people will be unable to stand. |
| 7 | Terrible | Over 30% of houses may be crushed, landslides will occur and the ground will fissure |

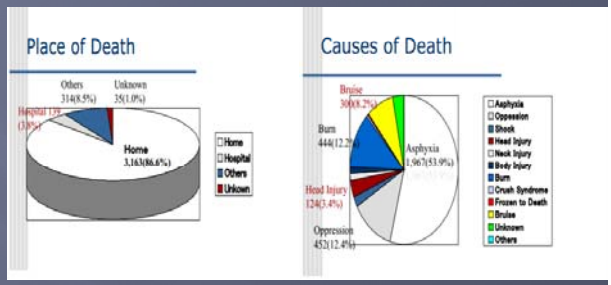
# Main features of the Earthquake ( reasons of high number of death toll)

## The earthquake struck an aging society

***More than half of the dead were over 60 years old, most of whom lived in old wooden houses in the densely populated areas of the inner city of Kobe. Traditional style Japanese houses have very heavy tile roofs in order to resist the strong winds that accompany typhoons.*** **The Kobe area had not experienced a major earthquake for more than one thousand years, and the local governments and residents in this area had no experience of an earthquake with an epicenter close to Kobe (in this one the distance between the epicenter and city center was only 20km) Inspection doctors inspected 2,416 bodies and estimated the death time.** ***92% of victims were dead within fifteen minutes after the quake.***

***The earthquake struck a region with a rapidly aging population. When old wooden houses collapsed, many senior citizens died under the ruins of their houses or furniture 86.6% of victims were dead in their own houses.***

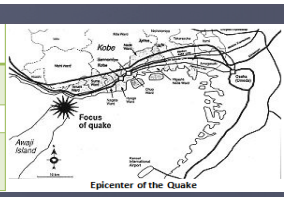
***In other words, most of the deaths in this earthquake were caused by the collapse of old Japanese houses. And half of those people were over sixty*** **since the elderly tend to live on the ground floor to avoid climbing stairs. There were many patients suffering from acute renal failure and crush syndrome that 6 had been rescued from fallen buildings or furniture and admitted to hospital.**




| Age | ~ 9 | 10s | 20s | 30s | 40s | 50s | 60s | 70s | 80s | 90~ |
|---|---|---|---|---|---|---|---|---|---|---|
| Number | 242 | 301 | 467 | 258 | 467 | 805 | 1047 | 998 | 692 | 91 |

The number and the age of died residents

| The Cause of Death | % |
|---|---|
| Pressure or suffocation | 89 |
| Burnt | 10 |
| Crushed by a fallen highway | 1 |




Epicenter of the Quake

## Rescued people

*On the first 3 days 96% of a total rescued were saved (on the first day, there were 486 survivors, on the second 129, and on the third 89).*

*These three days are called the "golden seventy-two hours" for rescue, and this disaster proved it correct. In Kobe, fire department workers rescued 1,888 people over a period of two weeks, but only 733 of them survived. Neighbor s' help and cooperation are very important just after an earthquake. In this event, many university students living in dormitories and other young people took active parts in rescue operations.* The trend through the end of bubble economy of early 1990s was the residing of the young families on the outskirts of the big cities, Kobe including, because of the very high land costs in big Japanese cities. In the inner city, older people who have lived for more than twenty to thirty years in cheap rented houses cannot move elsewhere because of expensive house and comminuting costs. Therefore vulnerability to natural disasters has increased year by year.

*Many buildings and houses were crushed, therefore it was very difficult for fire fighters and rescue teams to act at accident scenes. Because fire fighters and rescue teams usually use destructing tools, such as an engine cutter, a chain saw and so on and there were not enough, it was very difficult to conduct such operations.*

*Especially at the accident scenes of crushed buildings it was necessary to utilize crane trucks, shovel cars and so on. But construction companies had also damages and there were many traffic jams, therefore it took much time for those trucks to reach accident scenes.*

The number of rescued people

| Data | 17 | 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|
| **Total** | **604** | **452** | **408** | **238** | **121** |
| **Alive** | **486** | **129** | **89** | **14** | **7** |

Neighbors carried out a person crushed under the house

## Initial response to the disaster and weakness of the disaster management system

*In Kobe City only 291 firefighters out of about 2,000 were on duty, Policemen on night duty numbered about 300. Therefore, at the time of disaster only about 600 officers were immediately available. Despite of the fact that due to the earthquake, many poles bearing electric and telephone lines were broken and, the buildings and facilities of NTT (Nippo Telephone and Telegram) were partially damaged the emergency number, 119, received quite a few number of calls* . Switchboard capacity also was not sufficient to handle the great increasing calls. At the time of the earthquake, 122000 telephone circuits were disrupted. *The ambulances carried about 400 injured people daily to hospitals applying the maximum carrying capacity of the ambulances while the total number of ambulances available at Kobe fire department was 15.*

*The area devastated by a fire was one million square meters through the total number of fires was 176, and the number of houses and buildings burned down was 7,453. Fortunately, on January 17th and 18th, there was no or very little wind as Nagata Ward had many chemical shoe companies, most of which were small or tiny enterprises occupying narrow areas and some of their chemical products could have contributed to enlargement of the fires. The Hanshin Expressway and JR-West Railway played important roles as fire break zones,* fire engines and crews that came from other cities and towns, encountered some problems: traffic jams in damaged areas delayed early arrival, many of the fire hydrants and the water supply systems were broken, collapsed houses and buildings covered the roads and stopped traffic, and ambulances from nearby cities and towns could not come to the damaged areas due to the lack of working arrangements among local governments. Consequently the increasing of firefighters was fractal. On January 17th, 800 firemen arrived and on the 20th (after 4 days) 2,400 were present. Such a gradual increase was not good for the early attempts at fire fighting.

# Fire fighting during the disaster response

The reason why so many fires broke out during the early morning is not clear. Osaka Gas Company supplies city gas (LNG) to this area, *and about 70% of the residences were equipped with gas meters which would automatically stop the gas flow at the time of an earthquake, Less than 10% of the residences, however ,were using gas at the time, therefore, these devices only partly contributed to reducing the occurrence of fire. Due to electric power failure at 5:46, on January 17, the streets were very dark without streetlights, and it was difficult to move or act. In order to rescue victims under the collapsed houses, some neighbors used matches and lighters which may have caused fires due to gas leaks at broken pipelines with low pressure.* There was quick restoration of electric power by Kansai Electric Company, which also may have generated fires owing to short circuits or overheated heaters. The switching on of electric appliances by fallen furniture or collapsed houses also was a main cause.

| Time | Higashinada | Nada | Fukiai | Ikuta | Sui | Hyogo | Kita | Nagata | Suma | Tarumi | Nishi |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Total | 17 | 17 | 12 | 6 | 2 | 17 | 1 | 17 | 13 | 6 | 1 |
| ~6:00 | 10 | 13 | 5 | 3 | - | 11 | - | 13 | 4 | - | 1 |
| ~7:00 | 1 | - | 2 | 1 | 1 | - | - | 1 | 4 | - | - |
| ~8:00 | 2 | 1 | 2 | - | - | 2 | - | - | - | - | - |
| ~9:00 | 1 | 1 | - | - | 1 | 1 | - | - | 4 | - | 1 |
| 9:00~ | 3 | 2 | 3 | 2 | - | 3 | 1 | 3 | 1 | 6 | - |

The number of fires on January 17th 1995 in Kobe

Reasons for this wide range of burnt area are:

Most of the fire hydrants were useless, because fire hydrants are on the same lines as water supply pipes, which were heavily damaged.

Due to many fallen buildings and wooden houses blocking the roads, it was impossible for fire trucks to get very close to the fire scenes. Since the fire fighters and trucks could not gain access and just close off a small area to fight a fire, bigger and bigger areas were needed to be able to gain control of a fire.

It was difficult to create ditches or fire breaks to prevent fires from spreading

Failures in conducting rescue operations (extracting from the rubbles)

Many buildings and houses were crushed, therefore it was very difficult for fire fighters and rescue teams to act at accident scenes. Because fire fighters and rescue teams usually use destructing tools, such as an engine cutter, a chain saw and so on and there were not enough, it was very difficult to conduct such operations.

*Right after the earthquake occurred, many injured people gathered to fire stations. Fire stations made temporary first-aid stations and ambulance crew members assigned priorities of care, "triage". People who needed more intensive care were transferred to hospitals.*

*But several medical institutions in Kobe were damaged. Most of the hospitals and clinics could not accept patients, because electricity and water service were stopped*

# Building Damage

*Fully collapsed and half ruined houses in Hyogo Prefecture respectively totaled 92,877 and 99,829 (as of April 24, 1995). After the 1978 Miyagiken-Oki earthquake disaster new, seismic building and structure codes were enacted, Buildings erected in accordance with the new code suffered little damage, whereas damage to older ones was severe. The downtown Sannomiya area had many old concrete buildings that included Kobe City Hall, Kobe West Civic Hospital, the Daimaru and Sogo department stores, and the Hyogo Police Station. Many of these public buildings were severely damaged. This is one reason why the official response to the earthquake was late.*

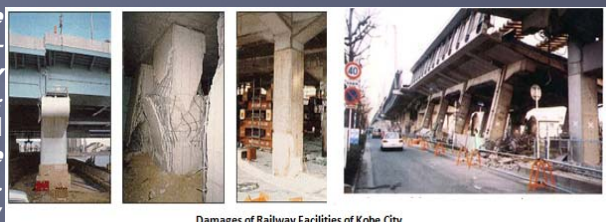
*Expensive land costs have stopped public works projects within the inner city: During the bubble economy of the late 1980s through early 1990s, land costs increased sharply year by year.* Every bank lent much money to businesses land owners, and individual s. *During that time, it was very difficult to buy land for infrastructure construction or the redevelopment of urban area.* No redundancy or fail-safe systems were adopted. The expansion of urban areas was too large. The total balance of urban activity and life have never discussed macroscopically, The socially weak, such as *the old, poor people ,and the physically handicapped ,were left alone inside the inner city to inhabit told, jerry- built wooden houses densely distributed and surrounded by narrow streets, many small factories and residential houses being located together.*

| Structural type | Collapse or severe damage | Moderate damage | Minor or slight damage | Total |
|---|---|---|---|---|
| RC(reinforced concrete)/SRC (steel reinforced concrete | 610 | 347 | 1797 | 2754 |
| Steel | 457 | 348 | 971 | 1776 |
| Total | 1067 | 695 | 2768 | 4530 |

# Lifeline Damages and Recovery

*As is known the Hanshin area is densely urban area The Hanshin Expressway ( highway), three railways (the JR-West, Hankyu, and Hanshin) were disrupted in many places except for Route 2. Other forms of mass transit; two subway lines ,two monorails* serving the Port and Rokko islands *and two local railways also were disrupted due to collapsed tunnels, piers, and bridges.* The Sanyo Shinkansen railway also was heavily damaged (elevated girders were broken at eight places and inside the Rokko tunnel the concrete lining was partially stripped off.) *The JR-West reopened on 1 April and the Sanyo Shinkansen on 10 April. The Hankyu and Hanshin railways respectively were restored to operation on 12 and 26 June, Damage to elevated highways was particularly serious, which not only prevented traffic on the highways themselves but also on the streets beneath them. Three hundred and eighteen bridges collapsed and roads were severely damaged in 9,408 place Railways were damaged in more than 90 places.'*

*Millions of people were thus deprived of their means of mass transportation. The elevated Shinkansen (bullet train) railway, which runs at a speed of up to 250-300 km/hr, was also damaged. If the earthquake had occurred one hour later, several trains would have been derailed and crashed off the elevated railways, causing thousands more dead and injured.*



Damages of Railway Facilities of Kobe City

A truck fallen from collapsed Iwaya overhead bridge of national road 43

A collapsed overhead railroad near the Shinzaike Station of Hanshin Railway

Damaged columns in the subway station, 1995 Kobe earthquake

## DAMAGE AND RECOVERY OF OTHER LIFELINES

1) **Gas**: *High pressure pipelines suffered no damage and middle pressure lines were repaired by January 31, whereas low pressure lines were completely destroyed.* On January 17, the gas supply was cut off to 857,000 residences and on February 17 only 295,OOO residences had the use of gas. By late March, the figure had increased to more than 98%. *Slow recovery mainly was due to having to check each house and the intrusion of water that leaked from high pressure water supply pipelines into the broken gas pipelines.*

*Some 9,700 of engineers were engaged in gas line repairs.*

2) **Electric power**: *In Japan, electric power usually is supplied by wires strung from poles In the case of collapsed houses and buildings it was not necessary to supply electric power quickly so the engineers cut many useless electric wires. This is one of reasons for the quick restoration of electrical power. Straight after the earthquake about 916,000 residences was blacked out. After the earthquake, 4,700 electrical engineers worked on repairs and the restoration of power.*

3) **Telephones and means of communications**: *On January 17, as a result of the earthquake about 285,000 telephone circuits were out of order.* Until January 20, about 4,000 telephone linemen were engaged in restoration work, after that about 7,000 NTT employees were active in repair work that eventually led to complete restoration of service by January 31. *The Kobe Fire Department had just installed an advanced computerized dispatch system with video monitors in December 1994. But on January 17, 1995, it was not yet operational and was not used during the disaster operations. Fire departments had their own radio systems, but could not communicate with other departments.* Communications capability proved very limited in the first critical hours following the earthquake.

These conditions proved overwhelming for the *Kobe Fire Department, which had primary responsibility for emergency response, with a total of 11 fire stations in the city, 176 engines, and 305 personnel on duty when the earthquake occurred. Three of the 11 stations were damaged in the earthquake,* and even with emergency call-out procedures, only 663 personnel were able to report for duty within the first two hours. *The actual destruction was beyond any training scenario for municipal emergency response.*

## DAMAGE AND RECOVERY OF OTHER LIFELINES

4) **Water supply**: The water supply was cut off to 1,355,600 cubic meters. The average daily supply rate was 1,363,000 cubic meters, 13% of the water coming from underground. *A total of 2,090 public and private water company engineers cooperated in this restoration work. The length of pipeline worked on was 7,685 km, of which 3,921km was in Kobe City.*

5) Waste-water: Kobe City has 43 water treatment plants, one sludge center, 3,315km of waste water pipes, and 484 km of rainwater pipes. *Due to the earthquake, 1,147 places in the waste water pipes and 267 places in the rain water pipes were damaged. Typical types of damage were the rising, sinking, and position gaps of 810 manholes. Immediately after the big shock, the tapped water supply in most of the downtown Kobe area stopped. Sewage channels were broken down. In some places, more than 3000 people were in very congested dirty areas. People could not use the toilet and some refugees became sick because the situation was so desperate.* They ate very little and drank almost nothing and were exhausted. In the night-time, the situation got worse. People tried to manage without going to excrete because they were afraid to disturb other people's sleep by getting up and finding their way across the very congested floor to the toilet.

People made great efforts to provide toilet facilities. *On the basis of this experience, the Kobe city government has now prepared a type of portable toilet that can be placed on the top of a manhole. Initially the Kobe authorities estimated that 300 of them would be enough, but in fact needed 3000 toilets, one for every 60-100 people. It was erroneous assessment of the essential humanitarian supplies as a part of insufficient disaster preparedness made by Hyogo prefecture in general and Kobe city authorities in particular.*

For the collection and disposal of waste, a tank lorry with a vacuum pump was most effective. It sucks up waste in an air tight condition without spilling a drop. Kobe eventually had 19 tank lorries operational and additional lorries came from other prefectures. Luckily enough there were not outbreaks of epidemic and infectious diseases. Respiratory infections such as influenza started to spread to a certain extent but were limited to small-scale epidemics.

*Each municipal government or public health sector had to prepare and stock clean, easy-to-handle portable toilets with a good disposal system items for emergency use. In the shelters, a good management system had to be established.*

## Providing Shelter

*After the earthquake, more than 300,000 people took refuge in schools, city halls, community centers and other public buildings private tents in parks, school play grounds, and open spaces along roads.* In most damaged areas, there was little public open space. Space for construction was available only in rural areas. *People wanted to live in a temporary housing area with neighbors who lived in the same areas before the disaster* whereas housing selection was independent of this condition. Moreover, *older people needed helpers and volunteers, and at the shelters, such assistance was readily available, The volunteers totaled more than one million, and they came from all over Japan,* Many university students gathered in the damaged areas, As the Japanese Red Cross does not systematically organize such volunteers, *their training and registration were became important problems.*

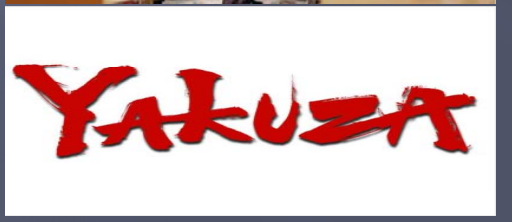
# Lack of coordination and communication

*For more than four hours, neither the Hyogo Prefectural Government nor the National Fire Defense Agency in Tokyo had a clear picture of the degree of destruction and damage in Kobe.* Constrained from action by the existing law until a request for assistance had been received from the City of Kobe, these *governmental agencies did not enter the response system until more than four hours after the initial shock.* In further irony, existing law kept the dogs from the French Search and Rescue team in quarantine, not allowing them to enter response operations until the fourth day after the earthquake when they extricated dead bodies, instead of living people.

Especially damaging was the lack of communication between the public agencies and the private utility companies. *Osaka Gas Company*, a private company and owner of the ruptured gas lines that were fueling the fires, was apparently not in communication with the city departments. *Only after reviewing the data from their own seismic monitoring devices at approximately 11:00 a.m. on January 17, 1995, did the company's Policy Group decide to close off five of the fifty-five blocks of their 50,000 km. distribution system. The company began to shut off the gas in critically damaged areas at 11:30 a.m., and completed the task about 11:50 a.m., six hours after the main shock occurred.*

*The gap in information and communication regarding emergency medical services was even more severe. For the first 12 hours following the earthquake on January 17, 1995, the Emergency Medical Division, Ministry of Health in Tokyo had little to no information regarding the conditions and need for medical services in the disaster area.* On January 23, 1995, six days after the earthquake, an Emergency Operations Center was established in Kobe with the assistance of the national Ministry of Health.

Interesting fact was the active role of the *yamaguchigumi*, the Japanese mafia, in the organization and distribution of disaster relief, in apparent cooperation with local governmental officials.




# Problems of emergency care

## Overwhelming casualties

As so many houses were destroyed and persons trapped all at the same time, with numerous fires breaking out, the emergency calls to the local fire departments overwhelmed their capacity. *In spite of the maximum efforts of rescue personnel, paramedics and ambulance crews, it was impossible to respond to every call.* In some places people had to dig out buried family members or friends almost with their bare hands. *On-site triage of the casualties by professional rescue and ambulance workers was almost impossible.*

Many mildly and severely injured patients and even dead bodies *were rushed by family members or neighbors to hospitals in the disaster area, which were themselves* variously *damaged* and in a state of general confusion. It was also cold and dark in the hospitals, *which had no electricity, gas or water supply. There was also a shortage of medical resources (sterile material) and human resources (physicians, nurses, clerical personnel) in the hospitals, especially in the first six hours after the disaster.*

# Problems of emergency care


Number of patients presenting at hospital in Nishonomiya on 17th of January (in parentheses the number of dead bodies brought in).

### Damage to medical facilities

Damage to medical facilities was a serious problem. *Out of the 180 hospitals in the disaster area, four were completely destroyed and 110 suffered serious structural damage. The 1,809 clinics in the area were similarly affected. Most of the sophisticated medical equipment, such as magnetic resonance imaging apparatuses, computed tomography, X-ray angiography apparatuses and chemical autoanalysers, was damaged and unserviceable.*

*In Kobe City Central Hospital, which is the core hospital in Kobe, water tanks on the roof were damaged and water poured down into the wards. The lack of water resulted in the breakdown of the water-cooled home power plant. The hospital electricity supply thus stopped completely about 30 min after the earthquake.*

*Apart from structural damage and damage to hospital equipment, the reduced presence of hospital personnel also decreased hospital functionality.* The attendance rate of personnel in hospitals on the first day of disaster was 58.4% for physicians, 35.0% for dentists, 44.2% for nurses, and 3 1.0% for clerical staff. In the first hours, when the hospitals in the disaster area were extremely busy, less than 50% of personnel were able to attend their hospitals. Despite the awareness of Japan to earthquakes the hospitals might have not been properly Prepared *The causes of reduced medical services were as follows; cut of water supply, interrupted telecommunication, cut off gas supply, shortage of medical and assistant staff, destroyed facilities or equipment, electricity blackout, shortage of drugs and other medical supplies* such as intra-venous solutions or local anesthetic ran out on the first evening.

*First-aid centers or stations were set up for primary medical care, and were manned twenty-four hours per day by medical and assistant staff. At one stage there were one hundred and sixty centers in operation.* It was possible to observe at the stage many teams dispatched from various organizations to support medical services such other cities or prefectures, the Self-Defense Force Japan Red Cross Society, Universities and public hospitals, Doctors Associations, and volunteer groups.

# Problems of Emergency Care


### Breakdown of telecommunication systems and lack of the information

Telephone lines were damaged or overloaded, with the result that this form of communication between hospitals was difficult in the first two or three days. The hospitals were not equipped with any form of radio communication system. On the first day, most of the medical personnel in the disaster area did not know that the hospitals in Osaka, only 20-25 km from the disaster area, had suffered no damage. TV news programs did not give any information about the chaos in the hospitals or about undamaged hospitals.

### Traffic congestion

The widespread destruction of streets, highways, bridges and railways caused severe traffic problems. Within an hour of the tremor every practicable road in the disaster area was full of cars with people leaving the area or on their way to visit family members to ascertain their safety -some even on their way to work. It was not uncommon to take several hours to drive 10 km. These conditions delayed the mobilization of relief teams from neighboring areas and complicated the transportation of casualties.

### Disproportionate number of patients in relation to medical facilities available

Although the hospitals in the central disaster area were extremely crowded, very few casualties were taken to hospitals outside the disaster area which had suffered no damage. For example, small to medium-sized private hospitals in Nishinomiya (south, west and north), which have 150 to 190 beds, were overwhelmed with more than 1,000 patients each on the first day. On the contrary, only about 60 patients presented at the Hyogo Medical College Hospital, which has about 1,000 beds and is located not many kilometers from the severely damaged area.

### Delay in transportation of patients between hospitals

Because of the traffic congestion and the lack of appropriate information exchange between medical facilities, the transport of severely injured patients from damaged hospitals to unaffected hospitals was somewhat delayed. When the severity of the damage in Kobe was reported on TV news programs, most of the tertiary emergency centers in Osaka prepared beds to receive large numbers of casualties. But in the first twelve hours only three patients were transferred to these emergency centers.

# Health problems of the displaced persons

At the peak point of the disaster, more than 310,000 persons were evacuated from their homes to temporary accommodation centers, such as schools, gymnasiums and other public buildings. There was no electricity, water or gas supply for several days and even weeks in these temporary shelters. Minimum supplies of food, clothes and blankets were soon provided, but sanitary conditions in such circumstances were far from perfect. The earthquake occurred in the coldest season of the year, and many persons caught cold while living in the shelters. In the early stages most clinics were closed and could not provide primary health care services for evacuees.

Countless numbers of volunteer medical relief teams fortunately came to the area from all over Japan and provided medical services for several weeks and months. Some 90% of private medical practitioners were however able to reopen their clinics within six weeks, thus restoring local medical services.

National and local government agencies began to provide temporary dwellings in March for those who had lost their homes. As it was difficult to find sufficient vacant land for all these temporary houses, they tended to be built at some considerable distance from the earthquake area. Many displaced persons thus lost touch with the original community with which they were acquainted.

The disruption for weeks and months of vital public services such as water supply, electricity, city gas, sewerage, garbage collection, telephone services and public transport made people's lives in the urban area intolerable. Disaster response plans defined at the level of national and local government did not at first function properly because the core organization (city government and prefecture government) failed to respond in the early phase. Lack of information and the breakdown of telecommunication systems led to disorganization of the disaster response. Medical services were also disrupted.

# Delay of Self Defense Force response

The Governmental response to the great Hanshin -Awaji Earthquake saw a delay in the dispatch and use of Self Defense Force in disaster areas. That was probably also the factor of huge casualties and injured of the disaster. This disappointing fact was attributable to 2 main factors. The first and primary one : according the Article 83 of the Self-Defense Forces law of 1954, requiring units to respond to calls for assistance from prefectural governors to aid in fire fighting, earthquake disasters, searches for missing people persons, rescues, and reinforcement of embankments and levees in the event of flooding. But SDF are deployed only upon the request of prefectural governor. Municipal mayors can ask prefectural governor to request a disaster relief dispatch by the SDF. But due to the fact that the telephone lines were out of order during the first day in large areas of the region, while others were overloaded local officials failed to connect with army official and request the assistance. As a result the tardiness of SDF disaster response was for more than 4 hours that in its turn cost lives of hundreds trapped under debris

The second one: delay was stipulated then existing relatively strong anti-military sentiment among the local leaders for deployment of JSDF for relief activities.

## Lessons learnt from disaster and Improvement of the whole cycle of disaster management

After the Earthquake the whole system of disaster management of the prefecture and as the disaster exposed the disaster management system of Japan need drastically modifying. ***The changes in the structure, interconnection methodology, synergy in all phases of disaster management between all actors including governmental and non-governmental structures mostly but not only related to filling the gaps detecting during the coping with the Kobe Earthquake.***


We can figuratively specify the amendments and establishments that were implemented in disaster management system of the country as well as prefecture as ***changes in disaster preparedness, changes related to disaster mitigation and changes in disaster recovery***

## Changes in Disaster Preparedness and Mitigation

**a) Conducting of Drills on Emergency Management Joint disaster management drills**

Practical drills on Disaster management tailored to the characteristics of the area are methodically conducted with the participation of local residents such as voluntary disaster response organizations with the aim of enhancing the awareness of citizens regarding disaster prevention, improving voluntary disaster response capabilities and strengthening cooperation among related organizations to raise the level of preparedness for typhoons, earthquakes and other disasters.

**b) Emergency drills held at schools**

More than once a year, evacuation drills are held with the assumption of earthquake or fire disaster occurrences at all of elementary and junior high schools in the prefecture. At schools, disaster management supplementary materials compiled by the Hyogo Board of Education are used in disaster preparedness classes as a part of school curriculum.

**c) Drills conducted on administration office level**

Emergency drills are also planned and implemented at the district administration office level, aiming to improve disaster management capabilities throughout the prefecture. Approx.80 officials at the Disaster Management and Planning Bureau and the Disaster Response Bureau take part in Disaster Imaging Game twice a year. Also, approximately 50 regular personnel residing in the standby accommodation take part in emergency drills four times a year

**D) Oil complex emergency drills**

Drills are annually carried out to improve and strengthen the disaster management system's capability to respond to a disaster at an oil complex

# Changes in Disaster Preparedness and Mitigation

**1.17 memorial" local emergency drills**

Local residents such as voluntary disaster response organizations, elementary schools and junior high schools are encouraged to participate in emergency drills , especially during Disaster Reduction Month that fall on January around 17 January - Hyogo Safety Day Earthquake prediction ( so-called " 1.17 memorial" local emergency drills)

**Community-based Specific Disaster Prevention Education and Training of Teachers in Hyogo Prefecture**

Applying the lessons of the Great Hanshin-Awaji Earthquake, disaster prevention education related not only to earthquakes but to all kinds of natural disasters is promoted in Hyogo prefecture.

Along with the allocation of ten disaster prevention education specialists (one to each education office), disaster prevention teachers with specialized knowledge are systematically and continuously trained.

Workshops in disaster prevention education are also held for regular teachers. It includes followings:

- Master plan for disaster prevention education in schools and annual teaching plan
- Efforts to utilize the time set aside for general studies and utilization of disaster prevention education supplementary reader,"1.17 shall never be forgotten " learning resources and community resources
- Enhancement of practical evacuation drills tailored to the characteristics of the area
- Improvement of mental health care
- Cooperation among different types of school and cooperation between schools and families, the local community and related organizations

In addition **Emergency and Rescue Team by school staff in Hyogo** (EARTH) - the team consists of teachers with specialist knowledge of disaster prevention and practical response skills was formed in 2000, April 1. The team is comprised of 150 school personnel and other members as of FY 2011. Along with providing support for rehabilitation of schools in afflicted areas and mental health care for children affected by disaster, the team members are often dispatched to provide drills or give lectures in disaster prevention to communities.




# Revision of Laws and Plans

The bitter lesson of the Great Hanshin–Awaji Earthquake brought about to revise and make amendments to then existing legislation and disaster management plans. The below mentioned amendments could be referred to improvement of disaster preparedness and disaster mitigation

Based on the lessons of the Great Hanshin-Awaji Earthquake, the following measures are in place.

Revision of laws and plans

(i) Amendment of the Disaster Countermeasures Basic Act Revisions

- Enhancing and strengthening the functions and operations of government disaster management headquarters by relaxing the conditions for establishing the Headquarters for Urgent Disaster Management led by the Prime Minister
- Establishing the On-site Disaster Management Headquarters as a legal entity
- Local government disaster management has been strengthened by allowing mayors to call upon prefectural governors to ask for the aid of the Self-Defense Forces.

(ii) Revision of the Basic Disaster Management Plan and the Local Disaster Management Plan

- The earthquake section of the Basic Disaster Management Plan, the most important plan in the disaster management sector, was completely revised.
- In addition, the comprehensive plans for local areas (the Local Disaster Management Plan) were also revised in each prefecture in light of the complete revision of the Basic Disaster Management Plan. As of April 20 04, 2, 390 municipal governments (76.5 percent of the whole) had completed their revisions.

(iii) The Act Concerning Support for Reconstructing Livelihoods of Disaster Victims

The law (The Act Concerning Support for Reconstructing Livelihoods of Disaster Victims) on funding victims of natural disasters by the local Government in order to rebuild livelihood was passed and implemented in 1998.

# Kobe city Disaster Management Plan

**Case study: Kobe city Disaster Management Plan**

This is a plan made by Kobe City Disaster management Council. The plan was revised entirely in 1996 based on the experiences incurred at the time of the Kobe Earthquake. Therefore the plan is one of the most detailed plans in Japanese municipal disaster management plans as the lessons learnt from Kobe Earthquake were condensed in the plan

**Securing lifelines**

**(i) Electricity**

After the Great Hanshin - Awaji Earthquake, 44 electrical fires broke out. Public service announcement surging people to turn off circuit breakers before evacuating are being implemented, but circuit breakers need to be constructed such that they will remain off even after electricity is restored until a confirmation button is pushed.

Kobe City Disaster Management Plan

**(ii) Gas**

For city gas, microcomputer- equipped meters that shut off when an earthquake is sensed have been required since the Great Hanshin – Awaji Earthquake. They functioned effectively during the Chuetsu Earthquake, preventing secondary damage.

**(iii) Water**

Many water pipes have been weakened by the use of asbestos-cement materials or have been in place more than 20 years, so pipe connections joints do not withstand earthquakes well. The Great Hanshin -Awaji Earthquake caused about 900,000 homes, mainly in Kobe, to lose water service. Currently, waterlines are being made earthquake resistant with ductile cast-iron pipes with earthquake - resistant joints, steel pipes, polyethylene pipes, and so on.

**(iv) Sewers**

Sewage facilities such as treatment plants, pumping stations, and pipelines constructed since the Great Hanshin -Awaji Earthquake are generally earthquake resistant. For joints, very elastic and watertight expanding and flexible joints are used,

# Passing of Earthquake Retrofitting Promotion Act, partial revision of the Building Standards Law, Urban Planning Law

**Passing the Act for Promotion of the Earthquake Proof Retrofit of Buildings (Earthquake Retrofitting Promotion Act)**

Based on the lessons of the Great Hanshin-Awaji Earthquake, Japan's Diet passed the Act for Promotion of the Earthquake Proof Retrofit of Buildings (Earthquake Retrofitting Promotion Act) in December 1995 to work towards early retrofitting of buildings that don't meet earthquake-resistant codes. ***Owners of designated buildings (schools, hospitals, theaters, department stores, offices, and other buildings of at least three stories and 1,000 m2 where many people gather) must carry out earthquake - resistance inspections and, if necessary, carry out earthquake retrofitting. Ordinary homes are not included. In 2004, therefore, parts of the Building Standards Law and the Urban Planning Law were revised in order to ensure the safety of building and proper urban disaster management.***


**Partial revision of the Building Standards Law (ensuring building safety)**

- Enhancement and strengthening of the reporting and inspection systems for buildings
- Issuing of directives to upgrade dangerous substandard buildings
- Strengthened penalties (corporate tax penalties for not complying with directives to perform upgrades), etc.
- Countermeasures for earthquakes and major fires in crowded urban areas, etc.
- According to new rules of revised Building Standards Law newly erected residential houses and construction should meet the requirement of earthquake resistant, seismic isolation and vibration suppressio

**Partial revision of the Urban Planning Law**

In order to strengthen measures for homes and buildings with insufficient earthquake resistance, designated buildings must undergo earthquake inspection and retrofitting within specified periods.

**Making homes and buildings earthquake resistant**

The cost of earthquake retrofitting for single family homes varies by the size of the house and the amount of work needed, but it averages ¥2 million per home.

Since the Great Hanshin - Awaji Earthquake, the support system for earthquake inspection and retrofitting has been implemented once in 2 or 3 years.


**Establishment of Global Assessment of Earthquake Countermeasures and Reconstruction Overall Verification and recommendations**

Five years after the Great Hanshin-Awaji Earthquake Japanese and foreign inspectors made various proposals regarding emergency relief, aid for victims, and reconstructions measures. The proposals were made in the framework of the Global Assessment of Earthquake Countermeasures that was conducted in 1999, five years after the great Hanshin-Awaji Earthquake. An overall verification resulted in more than 460 proposals on 54 topics in 6 areas.

## Establishment of new institutes, committees and designation of new post

**Establishment of Scientific Research institutes for elaboration and implementation of Disaster Reduction Policy**

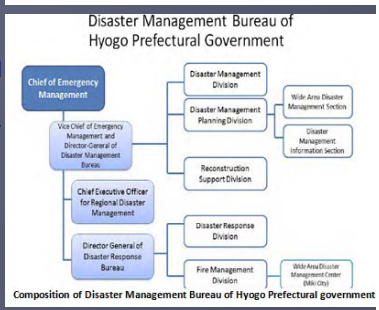
Japan's environmental and geological circumstances make it highly susceptibility to natural disasters. And, as is clear from its history of such disasters, inherent in Japan is the possibility of another large-scale disaster capable of severe damage over a large geographical area. **Disaster Reduction and Human Renovation Institution** ***has been established in order to transmit the experiences and lessons of the Great Hanshin-Awaji Earthquake to future generations so as to contribute both domestically and abroad to ameliorating damage inflicted by disasters, and to convey respect for the value of life and the importance of harmonious coexistence to the rest of the world***

People and Disaster Prevention Future Center Exhibition in Disaster Reduction and Human Renovation Institution

**Designation of a special post in Disaster Management System of Hyogo Prefecture and establishment of new actors in disaster management system of Hyogo prefecture**

**Hyogo Prefecture created the special post of Japan's first Superintendent of Emergency Management.**

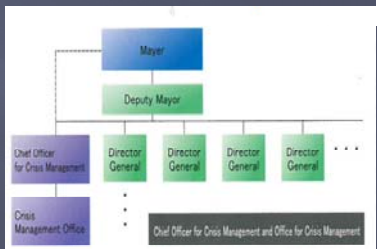
the Disaster Management Planning Bureau and the Disaster Response Bureau were established on 1 April 2005. The superintendent serves as the chief officer who assists the governor with the prefecture's crisis management following the 1995 earthquake. The Superintendent oversees approximately 90 personnel at the Disaster Management & Planning Bureau and the Disaster Response Bureau engaged in disaster preparedness , disaster response, as well as restoration and reconstruction after disasters.




Composition of Disaster Management Bureau of Hyogo Prefectural government

**Chief Officer for Crisis Management an Office for Crisis Management**

It is one of the most important lessons of the Kobe Earthquake for a local government to respond just after disasters. The position of "Chief Officer for crises management" and the office for crises management were newly established in 2002. The Chief Officer for Crises management is in charge responding for not only natural disasters but also man-made disaster such as large accident disasters or terrorism disasters. In absence of the Mayor or in regard to matters specified by the Mayor, the Chief Officer for Crises management can direct all the staff of the government of Kobe City in place of the mayor.



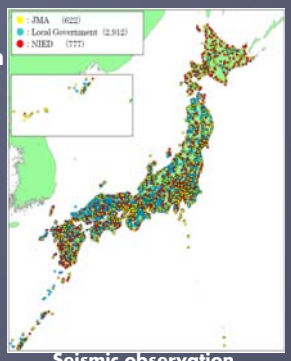

**Budget assigned for disaster risk reduction**

The Hyogo prefecture secures a budget both for construction and programs such as developing rivers and coastal areas, and maintaining the disaster management information system as well as the disaster-relief system

**Improvement of seismic observation network.**

For earthquake observation according to set forth in August 1997 "Basic Earthquakes Survey and Observation Plan" a system that covers the whole country in order to centralize and process data to the Japan Meteorological Agency was prepared. This is a highly-sensitive broadband seismic observation network covers the entire country with a high degree of accuracy consisting of set up terrestrial high –sensitivity seismographs (seismographs that detect very small vibrations that cannot be sensed by human beings) in 1,228 location and connected to JMA

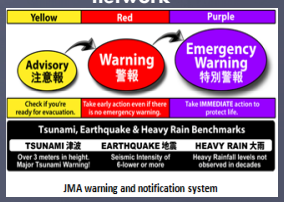
The prefectures begin transmission of seismic intensity data within four minutes after an earthquake. Transmission from all observatories is to be completed within nine minutes.




Seismic observation network

**Releasing the earthquake and tsunami warning bulletins**

The Japan Meteorological Agency began testing earthquake warning bulletins in February 2004. Currently, bulletins are being provided to about 140 organizations, including national disaster management agencies, local governments, universities, schools, and the private sector.

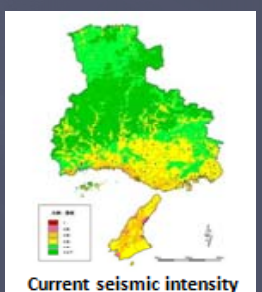



JMA warning and notification system

**Hazard maps**

Hazard maps are intended to keep disaster damage to a minimum. A long with clearly depicting expected damage zones and degrees of damage on maps, they present evacuation information such as shelters and danger zones in an easy-to-understand format.

Most hazard maps created and published to date indicate schools, community centers, and other evacuation points, but few show escape routes or designated evacuation routes.



Current seismic intensity distribution map of Hyogo

# Early Estimation System and an Emergency Measures Support System. Disaster Information System

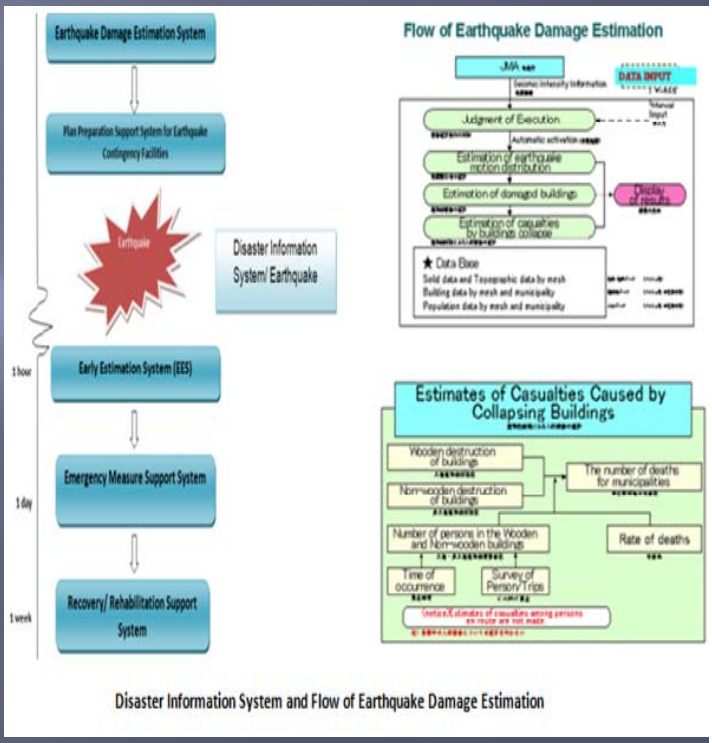
JMA and local governments developed seismic intensity observation points with seismographs. There are about 3,000 observation points nationwide. Based on the information from those observation points, the government developed Early Estimation System and Emergency Measure Support System.

After the earthquake, the government first estimates the damage such as number of deaths, injured, collapsed houses and so on.

Then the government estimates the needs of support in terms of materials, manpower for rescue and rehabilitation, hospital beds, evacuation camps etc. The estimation system is based on population, building structure information, ground conditions, time of occurrence and survey of persons using transport.

Damage caused to buildings is estimated according to seismic intensities for each 1-km mesh, building conditions and ground conditions. Further distribution of seismic intensity is obtained based on data from observatories.

Based on this damage estimation, the level of need for support is calculated by computer.



Disaster Information System and Flow of Earthquake Damage Estimation

# Adoption of J-Alert System, improvement of sediment disasters countermeasures, storm surge measures and flood control measures

## Adoption of J-Alert System

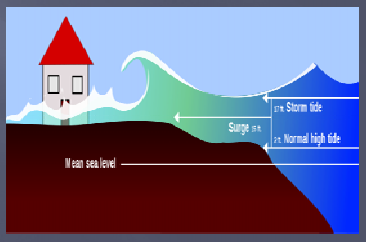
J-Alert is a nationwide satellite (Superbird –B2 communication satellite) based warning system designed to quickly inform the public of various threats It launched in February 2007 and allows authorities to quickly broadcast alerts to local media and to citizens directly via a system of loudspeakers. It takes about 1 second to inform local officials, and between 4 and 20 seconds to dispatch the message to citizens.

All warnings, except for severe weather warnings, are broadcast in five languages: Japanese, English, Mandarin, Korean and Portuguese (Japan has a small Chinese, Korean and Brazilian population). The severe weather warnings are only broadcast in Japanese. Information related to earthquake early warning, (hypocenter, magnitude, intensity, precaution to tsunami), tsunami, volcano eruption as well as military threats (ballistic missile launching, air assault, attack to nuclear plant, large scale of terrorism are able to be transmitted by this system.

J-Alert System

## Improvement of sediment disasters countermeasures and storm surge measures

River development projects are undertaken by Hyogo prefecture with the assumption of a heavy rain level that occurs once every one to five decades. The River Improvement Plan Review Committee established in conformity with the River Law conducts adequate analysis on disaster risk management. In order to counteract floods flood control measures for improving channels such as broadening rivers and elevating embankments, are now underway. At the same time, flood-controlling reservoirs for temporarily storing precipitation are being built. In addition, efforts are made to perfect its flood and storm surge control measures by establishing drainage pumping stations where deemed necessary. Hyogo prefecture is taking measures against storm surges by developing coastal areas that can withstand the highest sea levels aw well as undertakes flood control measures by improving rivers with the assumption of a heavy rain level that occur once every one to five decades.



# Improvement of Disaster response system. Establishment of Disaster medical center

**Establishment of Disaster Medical Centers throughout whole Japan and particularly in Hyogo prefecture**

The Prefectural Government had established the Disaster Medical Center named Hyogo Emergency Medical Center at August 1 in 2003. Hyogo Emergency Medical Center was designated as a Disaster medical center (main core hospital in Hyogo Prefecture) equipped with teaching function to train EMS (Emergent Medical Services) crews, and stock of EMS supplies (stockpiling drugs and other medical supplies) for emergency delivery.

Functions of the Hyogo Emergency Medical Center is as following

**Everyday duties**

- Offer rescue and emergency treatment as a rescue and emergency medical center.
- Operate a doctor car service.
- Receive patients brought by helicopter.
- Manage and operate the emergency information center.
- Implement courses, research, and training.

**Duties during disaster**

- Operate a disaster emergency information and instruction center.
- Receive patients from the disaster area.
- Dispatch relief workers

15 hospitals are designated as DMC in Hyogo prefecture. Main Disaster medical Center is Hyogo Emergency Medical Center. 2-3 doctors are nominated as Disaster Medical Coordinators Medical Coordinators in each DMC.

Training seminars of personnel are held several times a year

545 hospitals were designated as DMCs strategically located core hospitals in each region, retaining and training medical and assistant staff. Practical manuals have also been prepared for the improvement of disaster related medical care.

Location of hospitals designated as DMC in Hyogo prefecture


Location of hospitals designated as DMC in Hyogo prefecture

# Information Control Center

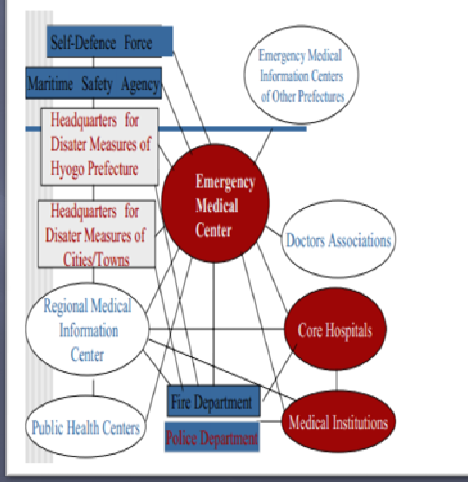
A disaster-related medical information network has been established in order to collect and disseminate medical information in the situation of disaster

The Disaster-related Medical Information Center is established to distribute medical information and to issue Instructions to medical institutions and ambulance services.

This is a wide-reaching telecommunication network, including high-speed dedicated ground or satellite lines, in order to increase the response speed in disasters. This can also be used as an emergency medical network during normal period.

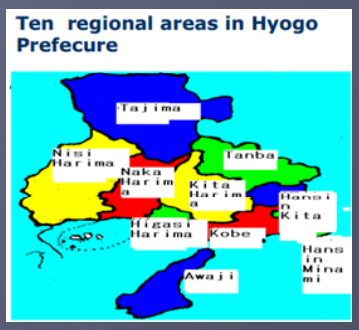
This information and control system links Hyogo Prefectural Government with medical institutes, core hospitals. Regional medical information centers, fire departments and the Disaster-related Medical Information Center through high-speed dedicated digital, satellite, or public lines. The authorities have constructed a system which in normal situations can be used for exchanging information, in the situation of a disaster , it will support prompt and exact emergency delivery

As a main disaster and emergency information center for Hyogo prefecture, the information and instruction center uses the internet to provide emergency medical information to fire stations, medical agencies, and it also provides information regarding medical agencies to the residents of the prefecture. During a disaster, the center collects information about the stricken area and patients received by the various medical agencies concerned, and then pass this information on to related organizations. Also, together with the local medical information centers and emergency hospitals specified for each secondary health care medical area, the center works with the fire fighting organizations, related to medical treatment, volunteers, etc, to secure disaster emergency medical treatment.

## Emergency core hospitals in Hyogo. Anti-seismic water storage tanks

There are ten regional areas in Hyogo prefecture. Strategically located Core hospitals were established for providing emergency medical services to regional areas in Hyogo prefecture. There are 15 core hospitals (4, Kobe,2, Tajima and Nakaharima,1,rest of each regions). They are the regional bases for treatment of patients in a disaster, having earthquake-proof buildings, large storage facilities for keeping drugs and other medical supplies, large water storage tanks, and electrical power generators. .These hospitals have a duty to retain and train emergency medical and assistant staff, and to dispatch first-aid teams to disaster area in the situation of disaster.




### Installations of Anti- Seismic Water Storage Tanks

In areas affected by Kobe Earthquake, fire broke out at the same time in 54 locations just after the earthquake. But the situation far exceeded the city's fire-fighting capacity. There was no water at fire hydrants because pipes had cracked. In addition the distance between mountain Rokko and the sea is very narrow. Most of the rivers in Kobe are very short and have a rapid and few streams. Therefore river water was insufficient for firefighting at that time.

From the lesson of the earthquake Kobe Municipal Government installed 250 anti-seismic water tanks which store 100 tons water in parks, schools and so on.

## Phoenix Disaster Management System

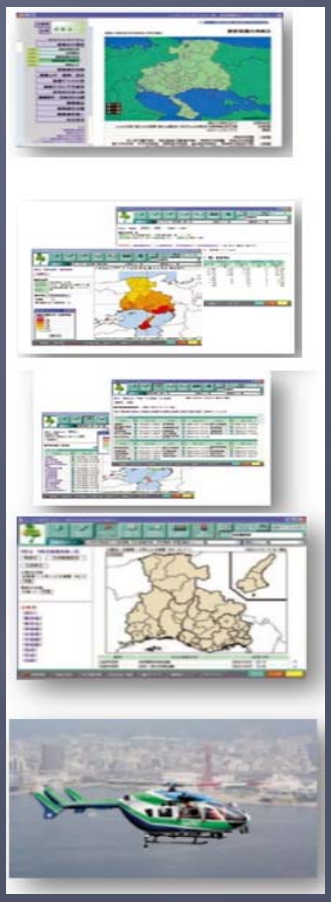
### Installation and utilization of Phoenix Disaster Management System

Phoenix Disaster Management System is a comprehensive disaster prevention information system that can quickly respond to earthquakes and other any kind of disaster, based on the lessons of the Great Hanshin Awaji Earthquake. This system has functions including the collection and provision of disaster and meteorological information, damage prediction, and the estimation of supply and demand, and it helps an initial rapid and accurate emergency response to be carried out. This is a complete system built by employing internet technology (web technologies) across the board. The system supports decisions made by the Emergency Relief Headquarters, providing damage predictions, disaster flash reports, a display of disaster situation map, and more, in addition to providing meteorological information. For the prefectural residents, it provides information related to disaster prevention on a web site. In order to share disaster related information, the system have set up terminals for disaster prevention at prefectural agencies, municipalities, fire departments, police headquarters, police stations, Fire and Disaster Management Agency, Self-Defense Forces and other relevant organizations and related agencies.

# Phoenix Disaster Management System

**Phoenix Disaster Management System at the time of an earthquake:**

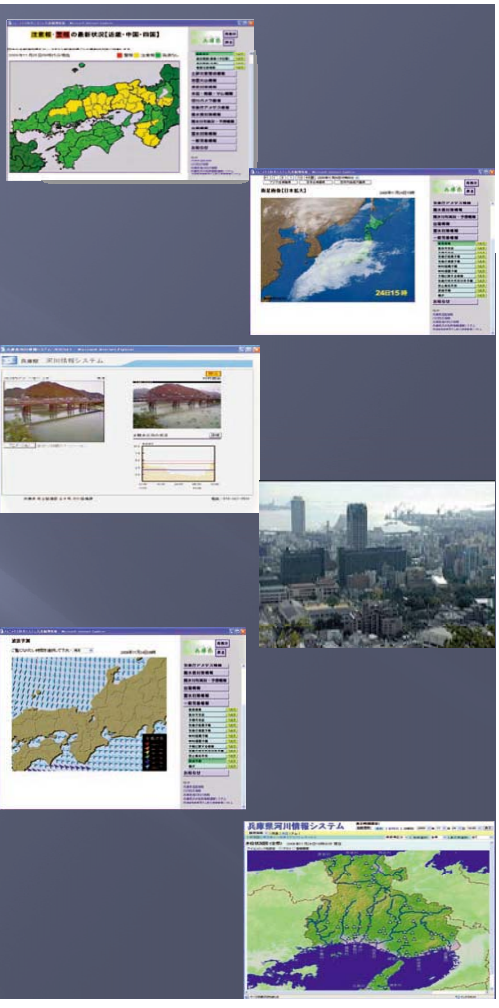
- If there is an earthquake with a seismic intensity of three or more (on the Japanese scale) within the prefecture, the system calls for attention by displaying blinking pop-ups, together with a sound
- The System collects earthquake intensity information from the seismic intensity meters set up at 96 locations within the prefecture (Seismic intensity information network)
- If the System observes an earthquake of a seismic intensity of four or more (on the Japanese scale), it estimates the damage per 500X500 m cell, based on geological and other ground–related information on the ground and display the results on a map and a list
- When an earthquake occurs, all municipal disaster-prevention-related organizations and others report, as their first notification, the damage situation regarding the offices and in the vicinity of the offices using a simple YES-NO form.
- As well as the state of prefectural measures, the system displays in general the following: the damage situation of each region (fatalities, housing damage, and fires); the state of the establishment of an Emergency Relief Headquarters; requests from municipalities; and the state of prefectural responses to the disaster
- Where required, the actual situation of the disaster is ascertained in real time, using on Heli-Tele images and other sources of information.



# Phoenix Disaster Management System

**During times of non-emergency**

- The System issues latest alert and update alarm status
- Issues satellite images
- Carry outs monitoring and makes wave prediction
- Issues the Map of water level status
- Keeps a record of water level graph and broadcasts river camera images
- The urban situation is ascertained using images from high-altitude cameras installed at fire departments (Kobe City, Amagasaki City, Nishinomiya City, Ashiya City, Akashi City, Kakogawa City, Takasago City, Himeji City) and at Shiso City Hall.
- The system delivers disaster prevention and meteorological information as well as disaster-related information to prefectural residents.



# PHOENIX DISASTER MANAGEMENT SYSTEM

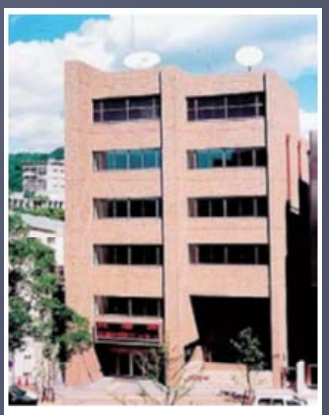
The below mentioned information accumulates by the Phoenix Disaster Management System and transmit to Hyogo Disaster Management Center:

- Earthquake information (Hyogo Prefecture seismic intensity information network)
- Meteorological data( Kobe Marine Observatory) West Japan ADESS (the Automated Data Editing and Switching System)
- Local Meteorological Information (Operators transmitting meteorological information)
- Information on rainfall and water level (Hyogo Prefecture River Information System,
- Hyogo Prefecture landslide disaster information provision system)
- High altitude camera image information( Fire Departments and headquarters, Kobe City, Amagasaki City, Nishinomiya City, Ashiya City, Akashi City, Kakogawa City, Takasago City, Himeji City, Shiso City Hall
- Tsunami observation camera (Minami Awaji City (Aman))
- Heli-Tele image information (Hyogo Prefecture Heli-Tele System)
- Systems related to disaster prevention (Hyogo Prefecture wide-area disaster information system on emergency medical care, Hyogo Prefecture road information, Hyogo Prefecture hazard map, Hyogo Prefecture maritime disaster prevention information, Hyogo Prefecture notification system for flood danger and other information, etc.

# Establishment of "Hyogo Disaster Management Center"

Based on the lessons learnt from Great Hanshin-Awaji Earthquake and in order to collect accurate information immediately after disaster Hyogo prefecture prepared "Hyogo Disaster Management Center" on 22 of August 2000. It is the first municipally–owned facility dedicated to disaster control, particularly in Hyogo prefecture area. It serves as central base for preparedness and information collection. The Center functions as the base for rescue activities, utilizing the Phoenix Disaster Management System for disaster related information collection, damage assessment and emergency measures.

It locates in the building that can withstand a 7 level earthquake on the Japanese scale. The Center fully equipped with facilities for disaster management. This Center secures exclusive work space for related organizations including the Self-Defense Force, the police, fire-fighting authorities, and lifeline companies and media



Disaster Management Center

# Establishment of Emergency Relief Headquarters Control Room

The room serves as the central base for disaster management activities. Desks are arranged in horse shoe shape so that the Chief of Headquarters, namely Governor of Hyogo Prefecture and the other designated members can actively discuss. This room is equipped with Phoenix Disaster Management System.

### Night duty room

This center utilizes a 24-hour watching and prompt response system to prepare against disaster even in day and night as a disaster .may occur anytime. Staff stands by in the Center all day throughout the year

### Broadcasting room

Broadcasting equipment is installed in this room to provide information directly to local residents in the prefecture when a disaster occurs. Emergency broadcast is delivered through an AM radio station

### Network control room

Information and communication devices are installed in this room, including the server, Phoenix Disaster Management System, radio communication devices that utilize satellite communication networks. The devises are protected from seismic vibration by a base-isolated floor.

# Formation of Regional Emergency Management Bases

Based on the experiences and lessons learned from the Great Hanshin-Awaji Earthquake, Hyogo Prefecture established six regional emergency management bases within Hyogo, which will serve as centers for storing, collecting and distributing relief supplies and equipment, and as bases for assembling and mobilizing emergency relief workers.

Function of Regional Emergency Management Bases

### Storage

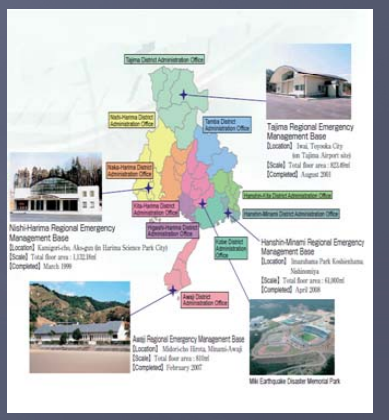
Storage of relief supplies for victims (blankets, emergency food supplies, etc.) and rescue equipment (engine cutters, chain saws, etc.)

### Collection and distribution of supplies

In the event of a large-scale disaster, the bases become transport centers for collecting relief supplies sent from all over the country and distributing them to the affected areas.

### Assembly and mobilization of relief workers

The bases become centers for emergency relief activities, dispatching workers from other areas to aid rescue activities and restoration work in the afflicted areas.




Regional Emergency Management Bases

[Stored items (including planned items)] As of May 2006

| Name of base | Food (dried rice) | Blankets | Lifesaving systems | Plastic sheets |
|---|---|---|---|---|
| Miki Earthquake Disaster Memorial Park | 77,000 | 50,820 | 29 | 5,133 |
| Nishi-Harima | 16,000 | 10,560 | 7 | 1,066 |
| Tajima | 4,000 | 2,640 | 2 | 267 |
| Awaji | 3,000 | 1,980 | 2 | 200 |
| Hanshin-Minami | 18,000 | 11,880 | 7 | 1,200 |
| Total | 118,000 | 77,880 | 47 | 7,866 |

*Also stored are temporary toilets, tents, floodlights and generators.

# Hyogo Prefectural Miki Emergency Management Base (functions during disaster and normal times)

Hyogo Prefectural Miki Emergency Management Base consist of the "Learning and Training Zone" (52 ha) and "Disaster Management Park Zone" (202 ha). The Base provides disaster training and education for citizens as well as functions as a sports and recreational center. But in the event of a major disaster, it serves as a prefecture-wide emergency management base.

Miki Emergency Management Base

**During a disaster:**

In the event of major disaster, Miki Emergency Management Base will ensure the smooth distribution of relief supplies in cooperation with regional emergency management bases both within the prefecture and in the Kansai region. It will also serve as an operation base for emergency relief workers, and implement quick and effective disaster response measures

**At normal times - Learning and Training Zone:**

- **Disaster education for citizens**: Provides hands-on learning and training for citizens to raise awareness of disaster risk reduction.

Holds the Hyogo Disaster Management Leader Training Course which includes lectures, exercises and emergency drills, with the aim of fostering leaders of voluntary disasters response groups.

Hyogo Prefecture Firefighting Academy provides training for firefighters and volunteer fire company members so that they can respond to complex and diverse disasters

- **Improvement of disaster response abilities of relief workers** : Provides various types of emergency drills at the rubble rescue training facility from fire departments, the police, self-defense forces, Disaster Medical Assistance Teams ( DMATs) and the Japan Disaster Relief Team
- **3-D Full-Scale Earthquake Testing Facility (E-Defense)**

Using the world's largest shaking table, an actual size building is shaken to the same degree as it would be during a high-intensity earthquake to study the destruction process. Experiments are performed by shaking a real-size 6-story structure and simulating the tremors that occurred in the Great Hanshin-Awaji Earthquake.





# Hyogo Prefectural Miki Emergency Management Base (functions during normal times)

**At normal times – Disaster Management Park Zone**

**Promotion of sports/recreational activities** - Equipped with various sports/recreational facilities, taking

**Storage of relief supplies and equipment-** Under the stands of the athletics stadium, there is a stockpile warehouse which stores relief supplies such as food, blankets and tents, as well as relief equipment such as life-saving systems( packaged equipment for self-defense forces) and generators

Athletics stadium

Storage warehouse (inside view)

In the event of a disaster, this will become a base for collecting relief supplies. The approximately 5,000 square meters of space below the stands are used for storage.

Truck yard (for transporting supplies)

| Name of Facility | Main functions | |
|---|---|---|
| Athletics stadium | At ordinary times | In the event of disaster |
| Second athletics stadium | Athletics stadium, soccer | Supply base<br>Truck yard |
| Baseball stadium | As above | Temporary heliport |
| Ball game stadium | baseball | Temporary heliport |
| Car park | Car park | Assembly and accommodation of emergency relief workers |
| Gymnasium | Basketball, | Supply base |
| Tennis courts | Tennis | Supply base, assembly and accommodation of emergency relief workers |
| Nature forest | Nature experience, environmental study | Supply base, assembly and accommodation of emergency relief workers |

## Development of disaster recovery system of Hyogo prefecture after the Great Hanshin-Awaji Earthquake

### Establishment and execution of reconstruction plans

With the aim of achieving the pre-quake level reconstruction after the Great Hanshin-Awaji Earthquake in January 1995, the Great Hanshin-Awaji Earthquake Reconstruction Plan (period: 1995 – 2005; budget: 17 trillion yen) was formulated and executed with the collaboration of public administration and local residents that mainly relate to restoration of housing, infrastructure and industry


## Development of disaster recovery system of Hyogo prefecture after the Great Hanshin-Awaji Earthquake :Urban redevelopment support project, Earthquake insurance

**Urban redevelopment support project**

Hyogo Prefecture promoted the Urban Redevelopment Support Project to dispatch advisors and consultants to local community groups of affected areas and support urban redevelopment activities of them.

**Earthquake insurance**

The Government of Hyogo prefecture along with private sector companies established an earthquake insurance system and jointly operate.

# Conclusion

Being one of the most disaster prone areas in Japan Hyogo prefecture has developed sophisticated and all-embracing disaster management system. The disaster management system in Hyogo Prefecture has been heavily influenced by unfavorable geographical position, as well as, meteorological, and topographical conditions and various large-scale disasters have been driving force of new changes and enhancements to it. Current disaster management of the prefecture has been formed during the last 50-60 years but significantly modified for the last 20 years. Rapid development of the country during this period enabled it to make considerable investments on DMS and integrate latest technological achievements of the country to it.

The existing disaster management system of Hyogo Prefecture, although, has been form during relatively short time period put in place sophisticated mechanism which enables the prefecture to mobilize forces and resources and respond in a comprehensive manner any large-scale disasters promptly, considerably decreasing damage and loss. Although, complicated at first glance, comprehensively elaborated coordination enables to relevant bodies take concerted actions what increases efficiency of whole system.