DISASTER MANAGEMENT SYSTEM OF HYOGO PREFECTURE

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ACKNOWLEDMENT

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I would like to avail myself of this opportunity to express my great thanks to all professors and organization representatives who conducted for us presentations and lectures within the framework of ADRC arranged activities.

Knowledge attained through these sessions was the key to our understanding of many aspects of the research area and the lecture and presentation materials served as the main information source while writing it.

BACKGROUND

What is disaster management?

The United Nations defines a disaster as a serious disruption of the functioning of a community or a society. Disasters involve widespread human, material, economic or environmental impacts, which exceed the ability of the affected community or society to cope using its own resources.

The Red Cross and Red Crescent societies define disaster management as the organization and management of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular preparedness, response and recovery in order to lessen the impact of disasters.

Any disaster can interrupt essential services, such as health care, electricity, water, sewage/garbage removal, transportation and communications. The interruption can seriously affect the health, social and economic networks of local communities and countries. Disasters have a major and long-lasting impact on people long after the immediate effect has been mitigated. Poorly planned relief activities can have a significant negative impact not only on the disaster victims but also on donors and relief agencies..

Local, regional, national and international organizations are all involved in mounting a humanitarian response to disasters. Each will have a prepared disaster management plan. These plans cover prevention, preparedness, relief and recovery.

Disaster prevention

These are activities designed to provide permanent protection from disasters. Not all disasters, particularly natural disasters, can be prevented, but the risk of loss of life and injury can be mitigated with good evacuation plans, environmental planning and design standards. In January 2005, 168 Governments adopted a 10-year global plan for natural disaster risk reduction called the Hyogo Framework. It offers guiding principles, priorities for action, and practical means for achieving disaster resilience for vulnerable communities.

Disaster preparedness and mitigation

These activities are designed to minimize loss of life and damage – for example by removing people and property from a threatened location and by facilitating timely and effective rescue, relief and rehabilitation. Preparedness and mitigation are the main ways of reducing the impact of disasters. Community-based preparedness and management should be a high priority in physical therapy practice management.

Disaster relief

This is a coordinated multi-agency response to reduce the impact of a disaster and its long-term results. Relief activities include rescue, relocation, providing food and water, preventing disease and disability, repairing vital services such as telecommunications and transport, providing temporary shelter and emergency health care.

Disaster recovery

Once emergency needs have been met and the initial crisis is over, the people affected and the communities that support them are still vulnerable. Recovery activities include rebuilding infrastructure, health care and rehabilitation. These should blend with development activities, such as building human resources for health and developing policies and practices to avoid similar situations in future.

Disaster management is linked with sustainable development, particularly in relation to vulnerable people such as those with disabilities, elderly people, children and other marginalized groups.

Depending on its national hazard profile, geographical conditions and administrative organization every various countries and regions has established **tailored** emergency management system. Once system is in place, functional mechanism of emergency response - coordination of response activities and communication system are definitive factors.

So relative similarity of both Azerbaijan's and Japan's landscapes especially between Absheron peninsula 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 AND JAPAN

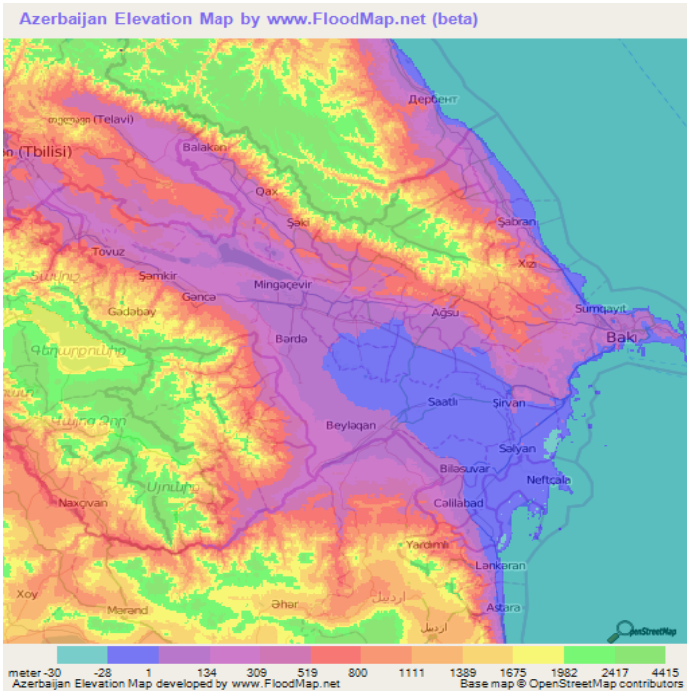
Humid subtropical climate that features by hot, usually humid summers and mild to cool winters is peculiar for both countries. Also both countries are located on the seismic split of the tectonic plates that in its turn stipulates higher seismic activity both in Azerbaijan and in Japan.

Hazard profile of Azerbaijan Republic

Azerbaijan is vulnerable to disasters due to both natural hazards, including floods, earthquakes, landslides, avalanches, drought, debris flows and mud flows; In the year 2000, a severe drought caused an economic loss of $100 million. As per GSHAP (GSHAP, 1998), occurrences of landslides during heavy rains cause significant damage to human settlements, industry, farms and roads (Pusch, 2004). However, the only reported disaster event due to a landslide was in April 2000. A total of 11 people were killed and economic loss amounted to $4 million. Azerbaijan also suffered from several technological disasters. There were reportedly 11 major transport accidents along with one major industrial accident between 1988 and 2007. These accidents killed 700 people and affected 357 others. However, no economic loss figures are available. The country also faces a possible nuclear radiation hazard originating from the nuclear plant at Metsamor, in Armenia. This plant is considered dangerous by the IAEA because of its location in an earthquake zone and its reactor type (Anagnosti, 2008)

FLOODS AND LANDSLIDES

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. The expected climate

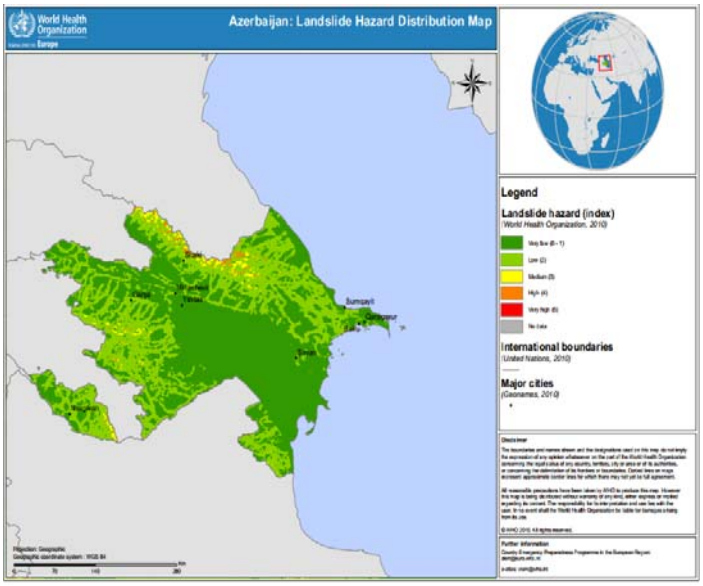


Flood map of Azerbaijan Republic

changes can cause serious difficulties in the future by increasing recurrence of floods and overflows. Heavy showers on the territory of Azerbaijan Republic often lead to floods with damages and human casualties. Moreover, hail fall is observed on the territory during warm periods. They cause damage to agriculture. Hail diameters sometimes are about 30–50 millimetres, which results in total destruction. 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.

Analysis of the disaster data show that floods have affected a large number of people and caused significant economic losses in the past 20 years. For example, the April 2003 flood in the Ismayilli Gobustan region alone affected 31,500 people and caused an economic loss of $55 million. Earlier, in June 1997, a flood in the Tovuz-Khanlar region affected 75,000 people and caused an economic loss of $25 million**.**

Besides, another 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

People are behind 80 percent of the landslides by their agricultural activity which increases the risk of landslides.

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

In Baku, landslides occur in Bail, Patamdart, Masazir, Ahmadli, Buzovna settlements, on the road to Novkhani, and recently intensified in the Garachukhur settlement.

Currently, Agsu Pass can also pose a threat in terms of landslides because of the passage of trucks on this road which negatively effects on this process.

Landslides are usually reported in spring and autumn in Azerbaijan

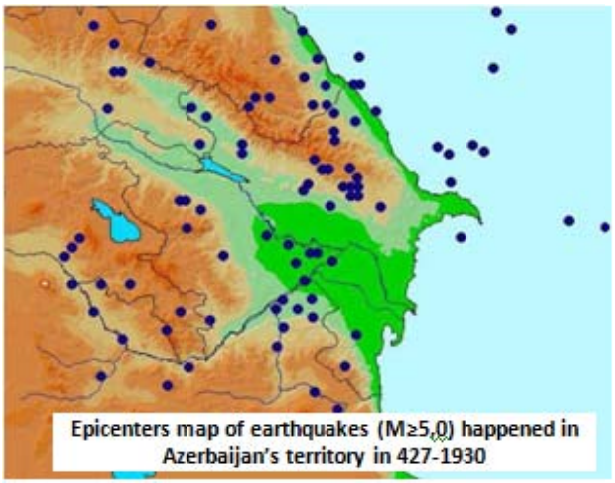
However, landslide zones have became more active in Azerbaijan since October, because of a drought in the summer months, and emergence of new cracks in the earth's surface and heavy rainfall In November, prolonged rains have triggered several landslides in the southern region of the country.

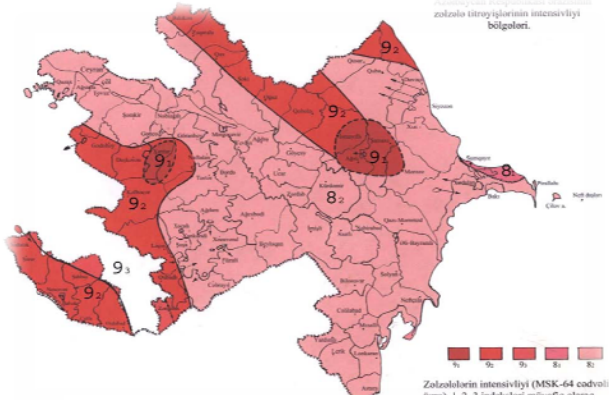
The prolonged drought is often observed in Azerbaijan, which in its term cause mudflows in the mountainous areas. The drought created a ground for further mudslides.

SEISMICITY

As a part of the Alpine folded system Azerbaijan territory characterized as very high seismic activity. Strong and catastrophic earthquakes which happened several times in this area from ancient times till now caused large number of human loses and destructions .The strongest earthquakes mainly have been registered in Shamakhi and Ganja regions. The earthquake happened in Shamakhi in 1668 (M ≈ 7.0; İ0 = 9-10 points) 2 can be considered as one of the strongest earthquakes happened in the Caucasus up to now.

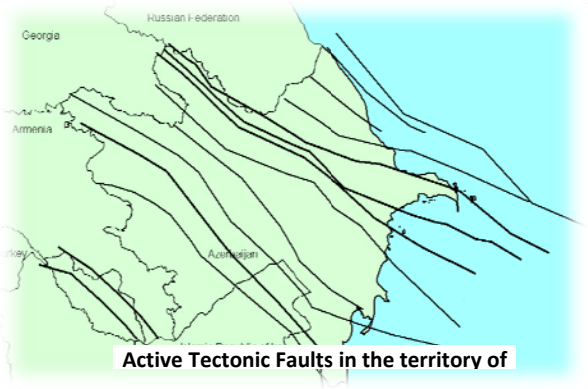
According to historical information this earthquake resulted with landslides and more than 80000 people died. In Shamakhi region registered seismic shocks with intensity up to 8 according MSK-64 in 1828, 1859, 1869 and 1872 years. In this area the last catastrophic earthquake (M = 6.9; İ0 = 9 points) happened in 1902.Other area where destructive earthquake happened is Ganja region. In this area happened strong earthquakes in 427 (M ≈ 6.7; İ0 = 9 points), in 1139 (M ≈ 6.8; İ0 = 9 points), in 1235 (M ≈ 5.7; İ0 = 8 points). After earthquake happened in 1139 because of landslide created Goy-gol Lake. In another regions of republic also were registered a number of strong earthquakes. Intensity of these earthquakes was not more than İ0= 6-7 points, but in many cases resulted with many destructions.





Seismic Zonation Map

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. An earthquake in July 1998 reportedly killed one person, affected a large number of people and damaged hundreds of houses



Active Tectonic Faults in the territory of

Since 2003 in the Azerbaijan territory installed 30 telemetry seismic stations production of “Kinemetrics”. Up to now in republican territory working analogue seismic stations also. During installation of these stations it was taking into account the level of the seismicity of selected territory

Recent years seismic stations with higher sensitivity seismographs has been added to the Republican Seismic Stations Network and after this it become possible to register even lower intensity (magnitude) earthquakes in republican territory.

MUD VOLCANOS

Mud volcanoes are pervasive 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. Most of them have a cone shape. Their height varies in the range from 20 to 400m, whereas base diameter may vary from 100 to 4500m.

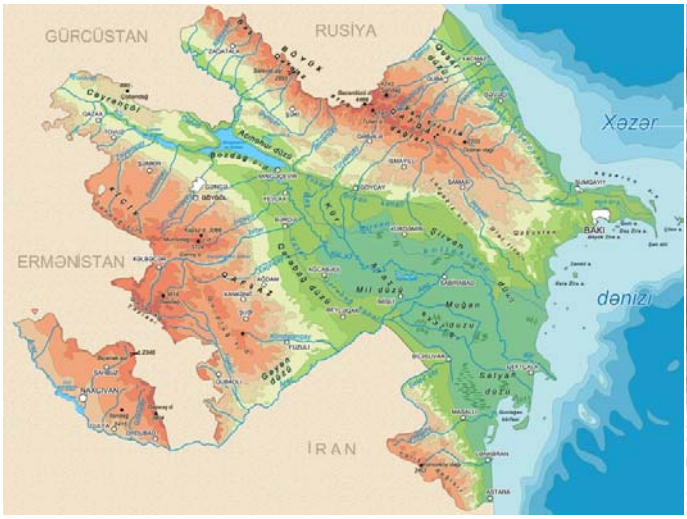
Besides onshore mud volcanoes there are buried volcanoes and offshore mud volcanoes. There are over 140 offshore mud volcanoes within the Caspian Sea. Eight Islands within Baku archipelago were generated by mud volcanoes eruptions (Khara-Zira, Zanbil, Garasu, Gil, Sangi-Mughan, Chigmil etc).


Mud volcanoes in Azerbaijan

Mud volcanoes are one of the visible signs of the presence of oil and gas reserves under the land and sea in the Caspian region. Gas seeps are a related phenomenon. These occur when a pocket of gas under the ground finds a passage to the surface. One gas seep burns continually on a hillside near Baku, ignored by the sheep but sometimes visited by curious tourists.

The origins of the volcanoes are disputed. Mud volcanoes are often formed in areas of weakness in the Earth's crust, along fault lines, and are associated with geologically young sedimentary deposits, the presence of organic gas from hydrocarbon deposits, and overlying pressure which forces this gas to the surface.

Drought Areas of Azerbaijan Republic



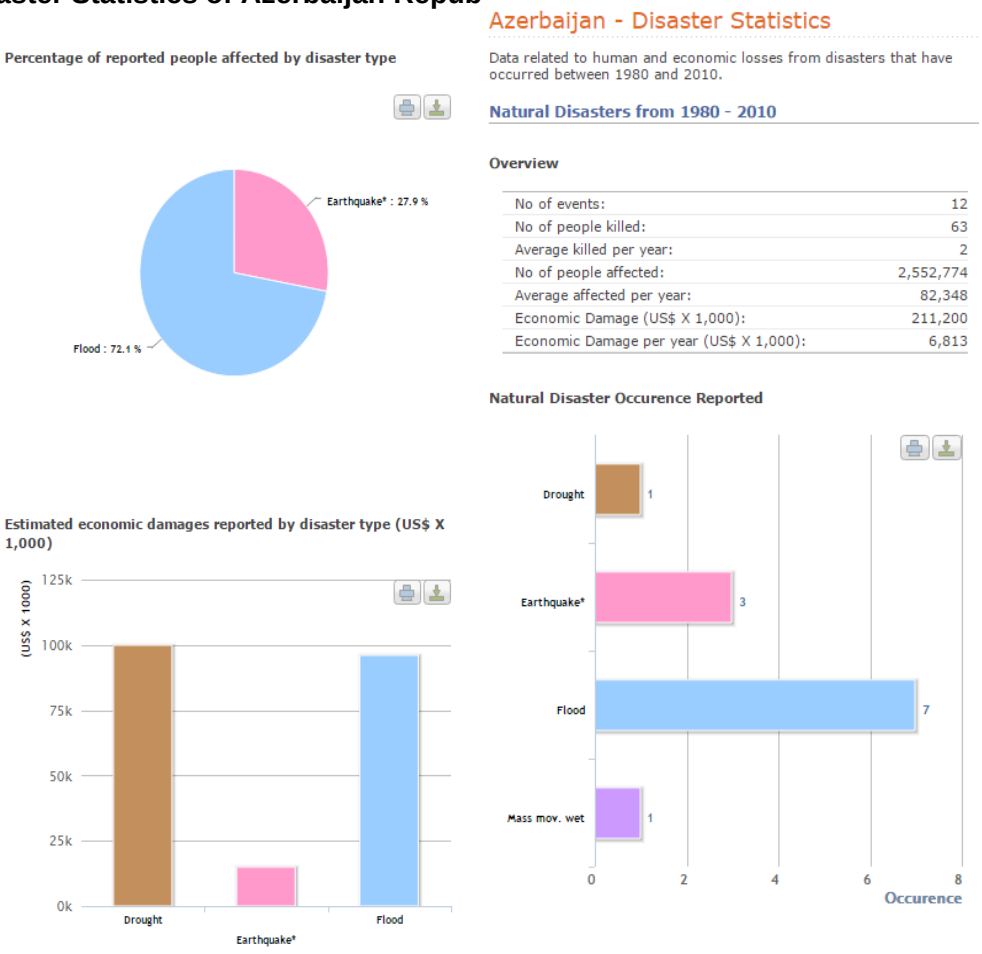
Physical map of Azerbaijan Republic

Drought lands in Azerbaijan

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. An FAO assessment mission carried out early January 2001 reported significant losses of harvests, particularly of potatoes and vegetables. 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. Several generations of fish have been lost due to a disruption in breeding patterns.

In Azerbaijan 3 mln. ha are exposed to desertinisation out of which anthropogenic desertisation amounts 12 thousand km². Repeated alkalization of the soils occuring due to demolition of incorrect irrigation system is understood as anthropogenic desertisation.

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

Disaster Related Economic Losses of Azerbaijan Republic

Economic Damages

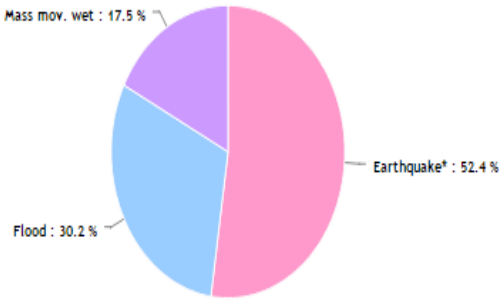
Drought:	100,000.00
Earthquake*:	5,000.00
Epidemic:	...
Extreme temp:	...
Flood:	13,742.86
Insect infestation:	...
Mass mov. dry:	...
Mass mov. wet:	...
Volcano:	...
Storm:	...
Wildfire:	...

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

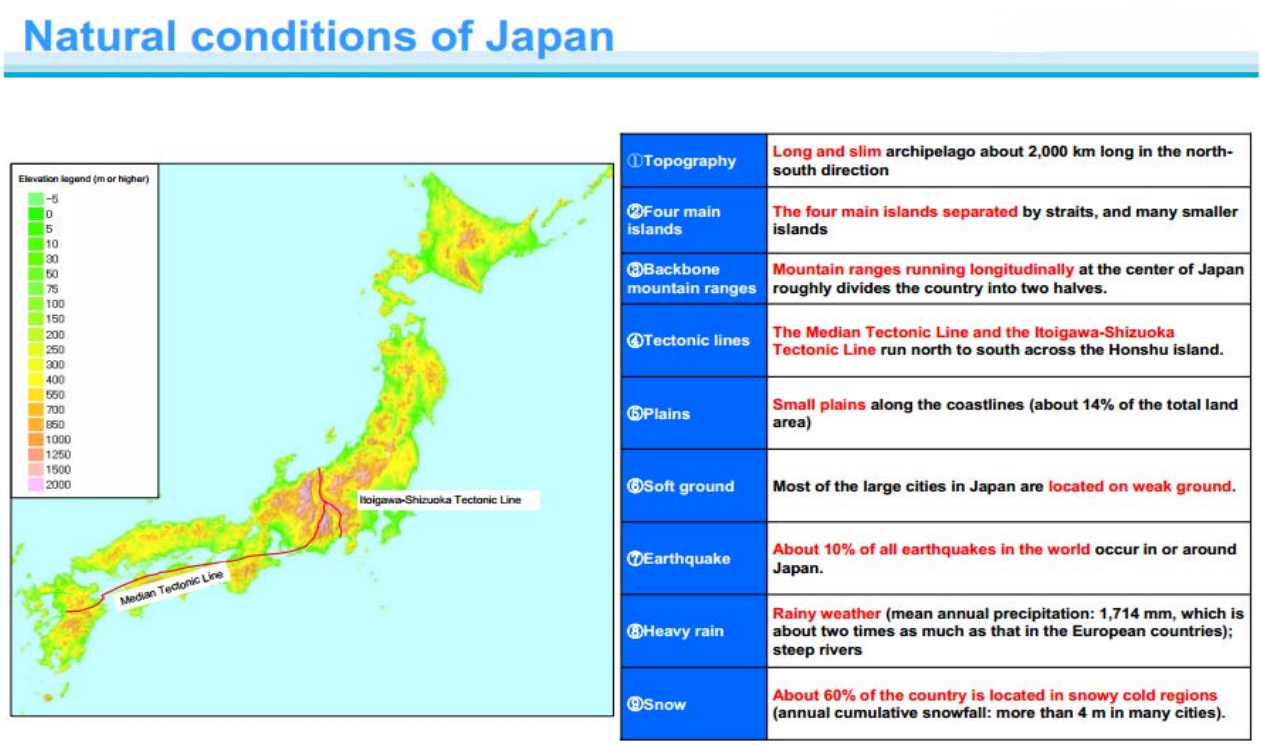
Killed People

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

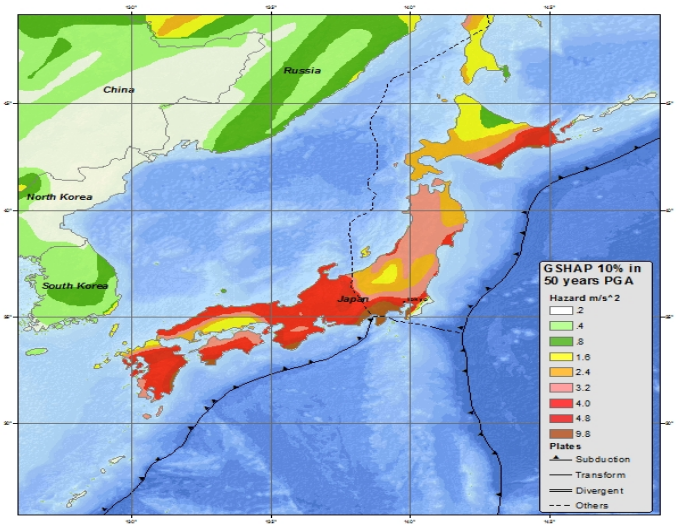
Drought:	...
Earthquake*:	237,491.33
Epidemic:	...
Extreme temp:	...
Flood:	262,900.00
Insect infestation:	...
Mass mov. dry:	...
Mass mov. wet:	...
Volcano:	...
Storm:	...
Wildfire:	...

Vulnerability profile of Japan



Natural condition of Japan

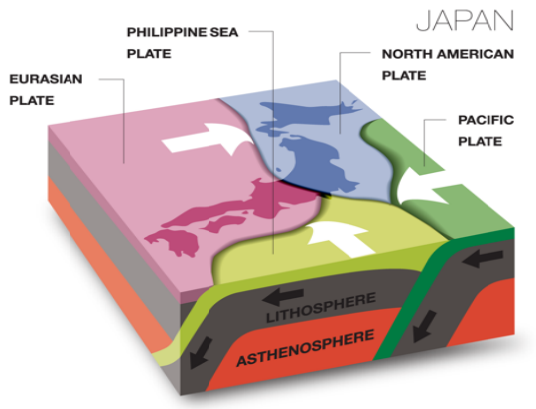
Historically, destructive natural disasters have posed greatest challenge for Japanese society. Unfavorable geographical, topographical and meteorological conditions of the country have made it one of the most disaster prone countries in the world. Although its territory accounts merely for the 0,25 % 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.



Seismic hazard map of Japan

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.

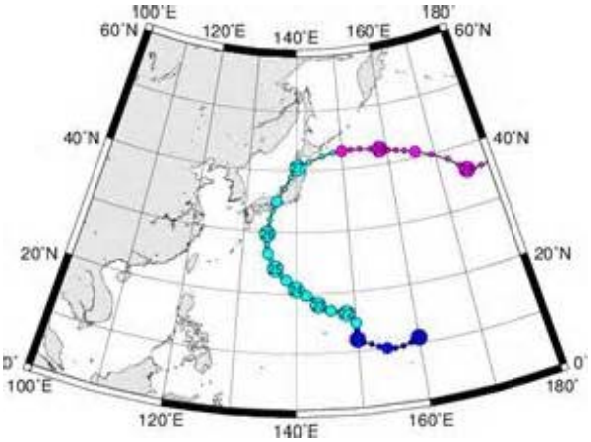
Japan located at the junction of 4 tectonic plates- Eurasian Plate, *Eurasian Plate, North American Plate, Pacific Plate and Philippine Sea* –which is the cause of high seismicity of its territory. Tsunamis are triggered by strong earthquakes at ocean bottom or huge landslides in the vicinity of the coast.



Japan at the junction of 4 tectonic plates

Earthquakes and tsunamis are the major causes of disasters. Although remarkable successes has been achieved in increasing preparedness of the country –crucial role of the JMA, MLIT and BRI is must be emphasized in disaster preparedness – to earthquakes and tsunamis, recent big disaster caused by them –Great Hanshin-Awaji Earthquake and Great East Japan Earthquakes demonstrated that they still remain as biggest challenge for disaster management system of the country.

Typhoons and rain front are the main causes of storm and flood disasters in Japan. About 10 typhoons hit Japan causing storm, tidal wave and high tides mainly during the period between May and October with August and September.1959 year is considered to be turning point in fighting with typhoons – in that after Isewan typhoon which caused to the death of more than 5000. Since then as a result of set of measures taken and application new technological advancements by Japan Meteorological Agency (JMA) number of dead or missing peoples in the result of typhoons sharply decreased.



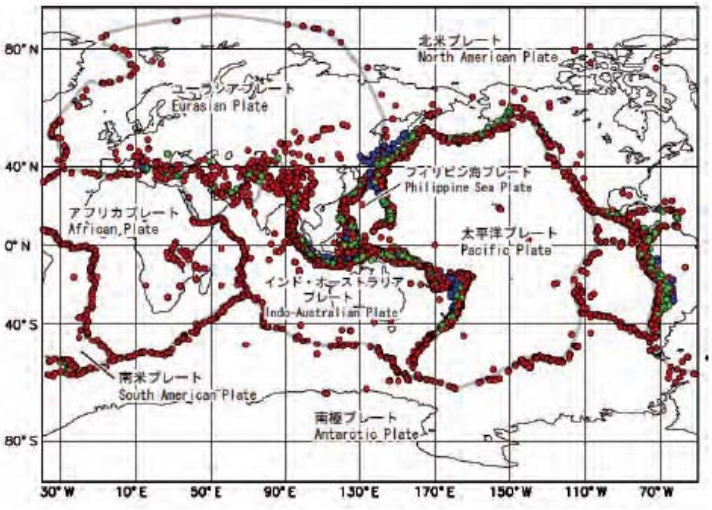
Ise-wan typhoon tracking map

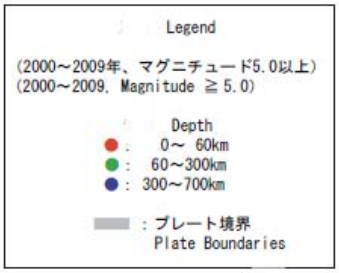
Fire vulnerability and risk in Japan is high. This is mainly due to large forest areas which cover about 70% of its total area, highly developed chemical and high-technology industries and close proximity of buildings in densely populated areas. Wildfires in Japan occur usually in dry seasons, mainly in summer. Moreover, tsunamis and earthquakes are also likely to entail large-scale fires in its immediate aftermath. About 7000 fire cases occurred in immediate aftermath of the Great Hanshin-Awaji earthquake in 1995.

Rivers in Japan are short and steep and flow rapidly and violently. Moreover, ratio between normal volume of flow and that during a storm is extremely great. 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. Charts and maps below explain situation in Japan with regard floods and sediment disasters.

Disaster Statistic of Japan

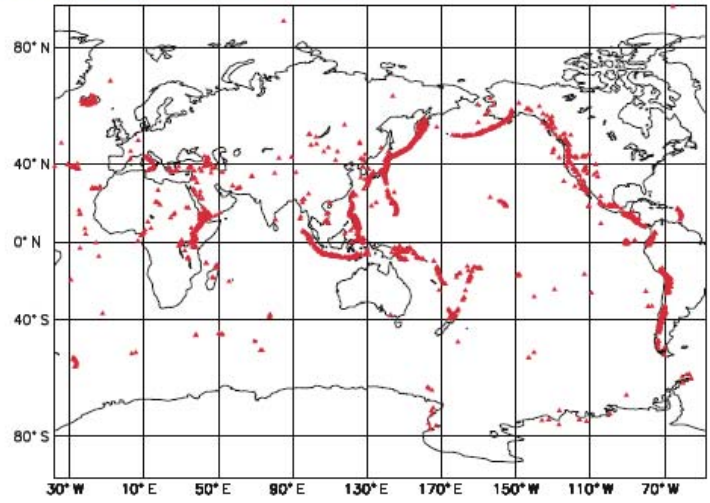
World Geographical Distribution of Hypocenters and Plates





Source : Prepared by the Japan Meteorological Agency based on data from USGS.

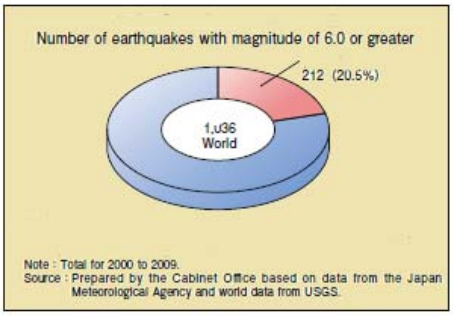
Principal Volcanoes in the World



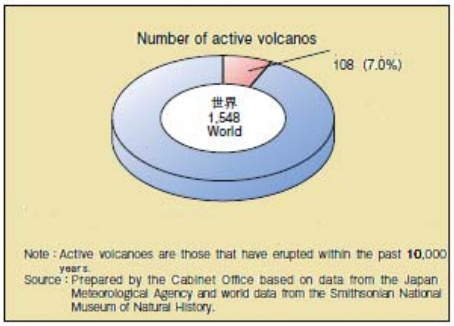
Note : The volcanoes shown are those that have been active within the past 10,000 years.

Source : Prepared by the Japan Meteorological Agency based on data from the Smithsonian National Museum of Natural History.

Comparison of Natural Hazards in Japan and Other Parts of the World (Earthquakes and Volcanoes)

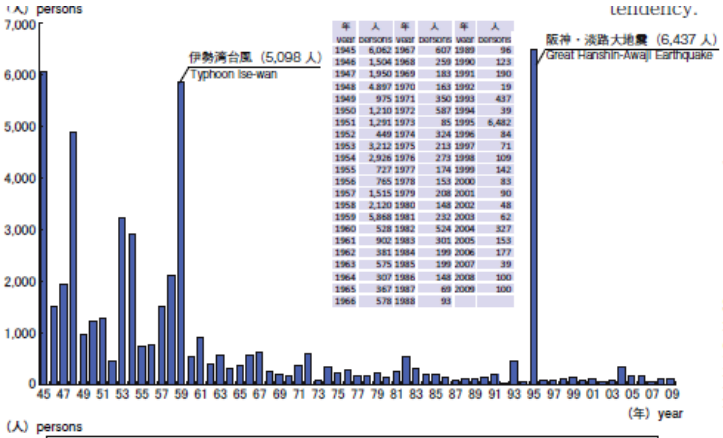


Note : Total for 2000 to 2009.
Source : Prepared by the Cabinet Office based on data from the Japan Meteorological Agency and world data from USGS.



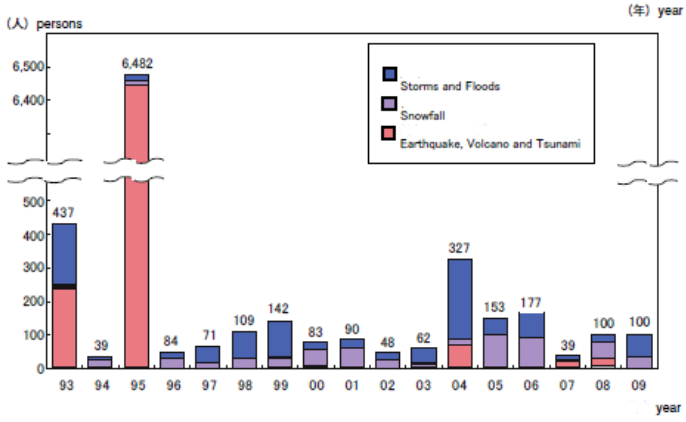
Note : Active volcanoes are those that have erupted within the past 10,000 years.
Source : Prepared by the Cabinet Office based on data from the Japan Meteorological Agency and world data from the Smithsonian National Museum of Natural History.

Disaster Statistic of Japan



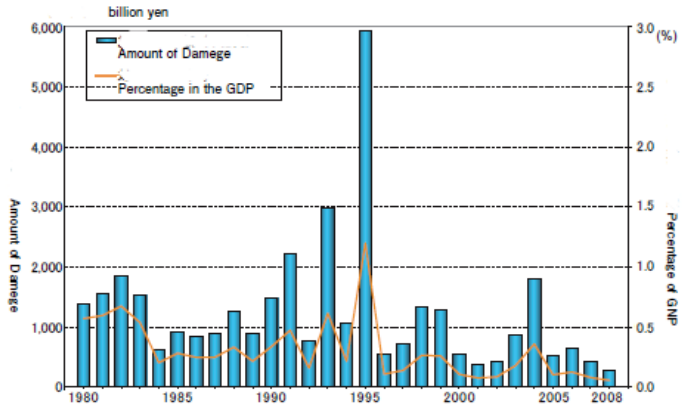
The Number of Deaths and Missing Persons in Disasters

Sources: Figures for 1945 are from Rika Nenpyo, indicating numbers of dead and missing from major disasters. Figures for 1946–1952 are from Nippon Kisho Saigai Nenpo. Figures for 1953–1962 are from National Police Agency. Figures for 1963 onward are from the Fire and Disaster Management Agency.



The Number of Deaths and Missing Persons by Type of Disaster

Sources: Prepared by the Cabinet Office based on Fire and Disaster Management Agency data.



Amount of Damage to Facilities Due to Disasters

Sources : Prepared by the Cabinet Office based on data from related ministries. GDP figures are from Annual report on national accounts.

Following are indicated the certain figures of disaster statistic of Japan and Hyogo prefecture:With the territory of 8,396 km^2 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

Hazard and vulnerability profile of Hyogo prefecture

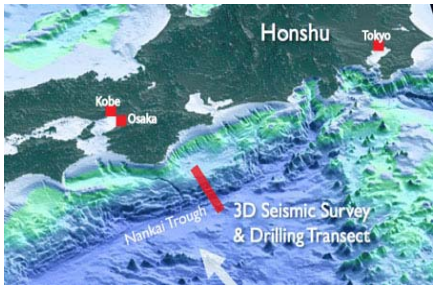
Major disasters that have occurred in the past:

Among disasters occurred in Hyogo, the following are the ones with the largest amounts of human suffering.

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

Prevailing hazards and vulnerable conditions

Examining previous disaster occurrences, major disasters expected to occur in Hyogo are as follows:



Earthquake originating from the Yamaki Fault and the Nankai Trough

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

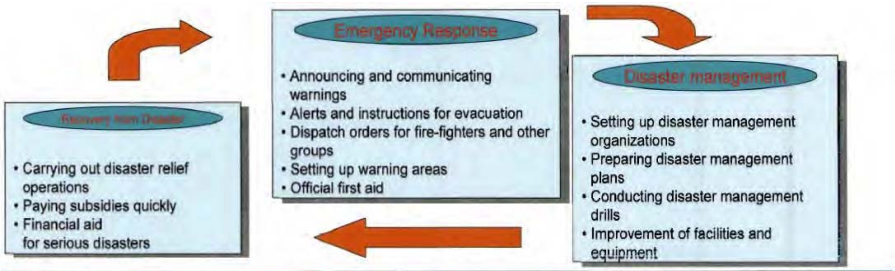
Landslide disasters in mountainous areas including Mt. Rokko

Legal Framework for Disaster Management regulations in Japan

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

The laws covering all phases of disaster management – preparedness, a prevention/mitigation, response and recovery/rehabilitation phase has laid down the legal framework for the disaster management system of Japan. According to the latest brochure of 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 [5; 6-7 p.]

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, two years after the Ise-wan Typhoon which caused tremendous destructions and loss of more 5000 people, the DCBA defined protection of national land as well as citizens' lives, livelihoods, and property from natural disasters as a national priority. The DCBA lays down the national level framework for the disaster management. The Law consists of X Chapters, 117 Articles, 11 Sections and governs



Local municipality level	Prefecture level	National level
•Making local disaster management plan •Responsible for first response to disasters 1 Setting up disaster management headquarter 2 Release of evacuation alert 3 Mobilization of fire fighting units	• Supporting municipalities` response • Coordination between municipalities` level and national level	•Making basic disaster management plan •National support to local governments •Dispatch of ERT and SDF in a large-scale disaster

the following matters: Definition of responsibilities of disaster management, Disaster Management Organizations, Disaster Management Planning System, Disaster Prevention and Preparedness, Disaster Emergency Response, Disaster Recovery and Rehabilitation, Financial Measures, State of Disaster Emergency. [5; 8p] and Penal Provisions. The Disaster Countermeasures Basic Act and related laws complement each other as general legislation and detailed legislation, the latter consisting of specific laws established in response to various specific needs. In the event of a disaster, specific laws are first applied depending on the nature of the disaster, and the Disaster Countermeasures Basic Law is only invoked where there are no provisions in these laws. The DCBA which 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. Chapter 3 and Chapter 4 of the DRA set the framework for the government policy with regard to costs management and reimbursement and penal provisions related with disaster relief activities. In the case of emergency relief, the Disaster Relief Law is referred to for matters such as rescue operations and the state contribution to relief expenses, for which the law has specific provisions. Under the law, relief is provided only in the event of, for example, the destruction of a certain number of houses relative to the population of the municipality or municipalities concerned due to a disaster. (Example: At least 30 households have their dwellings destroyed through total structural collapse in a municipality with a population of less than 5,000). The extent, methods and duration of relief are to be specified by the Minister of Health, Labor and Welfare (MHLW). The MHLW plays key role in implementation of DRA during disaster times as a central supervisory and coordinating body.

As stipulated by the law, relief is provided by a **prefectural governor** with the assistance of his municipal mayors. Where necessary, the prefectural governor may delegate part of his authority to municipal mayors. The Act defines the responsibility of the prefectural governor as follows;

The prefectural governor shall constantly endeavor to formulate required plans, establish powerful relief organizations, and provide for labor, facilities, equipment, supplies and funding to ensure fully effective.

The following types of relief activities are defined by the Disaster Relief Act*: setting up of places of refuge and emergency temporary housing; supply of food and water; supply of clothing, bedding, etc; rescue of disaster victims; emergency repair of houses*. *Provision of school supplies Burial arrangements; search for deceased victims and body treatment; removal of debris and other obstacles in and around dwellings.*

Disaster countermeasures are taken based on the Disaster Countermeasures Basic Act and various disaster management related laws.

〔Basic Acts〕

1. Disaster Countermeasures Basic Act (1961) 2. Act on Prevention of Marine Pollution and Maritime Disaster (1970) 3. Act on Disaster Prevention in Petroleum Industrial Complexes and other Petroleum Facilities (1975) 4. Act on Special Measures for Large-scale Earthquakes (1978) 5. Act on Special Measures for Nuclear Disasters (1999) 6. Act on Special Measures for Promotion of Tonankai and Nankai Earthquake Disaster Management (2002) 7. Act on Special Measures for Promotion of Disaster Management for Trench-type Earthquakes in the Vicinity of the Japan and Chishima Trenches (2004)

〔**Disaster Prevention and Preparedness**〕

1. Erosion Control Act (1897) 2. Building Standard Law (1950) 3. Forest Act (1951)
4. Act on Temporary Measures for Disaster Prevention and Development of Special Land Areas (1952) 5. Meteorological Services Act (1952) 6. Seashore Act (1956)
7. Landslide Prevention Act (1958) 8. Act on Special Measures for Disaster Prevention in Typhoon-prone Areas (1958) 9. Act on Special Measures for Heavy Snowfall Areas (1962) 10. River Act (1964) 11. Act on Prevention of Steep Slope Collapse Disaster (1969) 12. Act on Special Measures for Active Volcanoes (1973) 13. Act on Special Financial Measures for Urgent Earthquake Countermeasure Improvement Projects in Areas for Intensified Measures (1980)14. Act on Special Measures for Earthquake Disaster Countermeasures (1995) 15. Act on Promotion of the Earthquake-proof Retrofit of Buildings (1995) 16. Act on Promotion of Disaster Resilience Improvement in Densely Inhabited Areas (1997) 17. Act on Promotion of Sediment Disaster Countermeasures for Sediment Disaster Prone Areas (2000) 18. Specified Urban River Inundation Countermeasures Act (2003)

〔**Disaster Emergency Response**〕

1. Disaster Relief Act (1947) 2. Fire and Disaster Management Organization Act (1947）
3.Japan Coast Guard Act（1948）4.Fire Services Act (1948) 5.Flood Control Act (1949) 6.Police Act（1954） 7.Self-Defense Forces Act（1954）

〔**Disaster Recovery and Reconstruction**〕

1. Forest National Insurance Act (1937) 2. Act on Temporary Treatment of Rental Land and Housing in Cities (1946) 3. Agriculture Disaster Compensation Act (1947)
4. Act on Interim Measures for Subsidizing Recovery Projects for Agriculture, Forestry and Fisheries Facilities Damaged Due to Disasters (1950) 5．Small-Medium Business Credit Insurance Act (1950) 6．Act on National Treasury Share of Expenses for Recovery Projects for Public Civil Engineering Facilities Damaged Due to Disasters (1951) 7．Public Housing Act (1951) 8．Fishing Boat Damage Compensation Act (1952) 9．Railway Improvement Act (1953) 10.Act on National Treasury Share of Expenses for Recovery of Public School Facilities Damaged Due to Disasters (1953)

11.Act on Interim Measures for Financing Farmers, Woodsmen and Fishermen Suffering from Natural Disasters (1955) 12.Airport Act (1956) 13.Small-scale Business Equipment Installation Financial Support Act (1956) 14.Act on Special Financial Support to Deal with Extremely Severe Disasters (1962) 15.Fisheries Disaster Compensation Act (1964)
16.Act on Earthquake Insurance (1966) 17.Act on Special Financial Measures for Group Relocation Promotion Projects for Disaster Mitigation (1972) 18.Act on Payment of Solatia for Disasters (1973) 19.Act on Special Measures for Reconstruction of Disaster-stricken Urban Areas (1995) 20.Act on Special Measures for Reconstruction of Jointly Owned Buildings in Disaster-stricken Areas (1995) 21.Act on Special Measures for Preservation of Rights and Profits of the Victims of Specified Disasters (1996) 22. Act on Support for Livelihood Recovery of Disaster Victims (1998) 23.The Japan Finance Corporation Act (2007)

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.

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

Classification of Japanese rivers

The river administrator may use or expropriate necessary land, earth materials, bamboos, wood or other materials and use vehicles or other transportation equipment or devices, or dispose of structures or other obstacles or have people who live near or are present at the flood hazard site perform the flood protection activities. 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**.

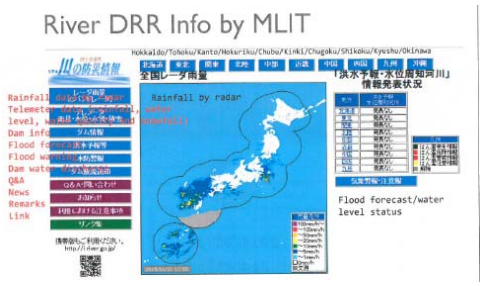
According to Flood Control Act the municipalities assumes the primary and full responsibility for flood fighting activities within their respective territories. The following flood mitigation measures are conducted based on the **Flood Control Act**: Patrol of river, Mobilization of flood-fighting and fire-fighting organizations, Ordering residents to evacuate, Reporting and publishing water levels, 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

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

Class C rivers are monitored and measured by Municipalities



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

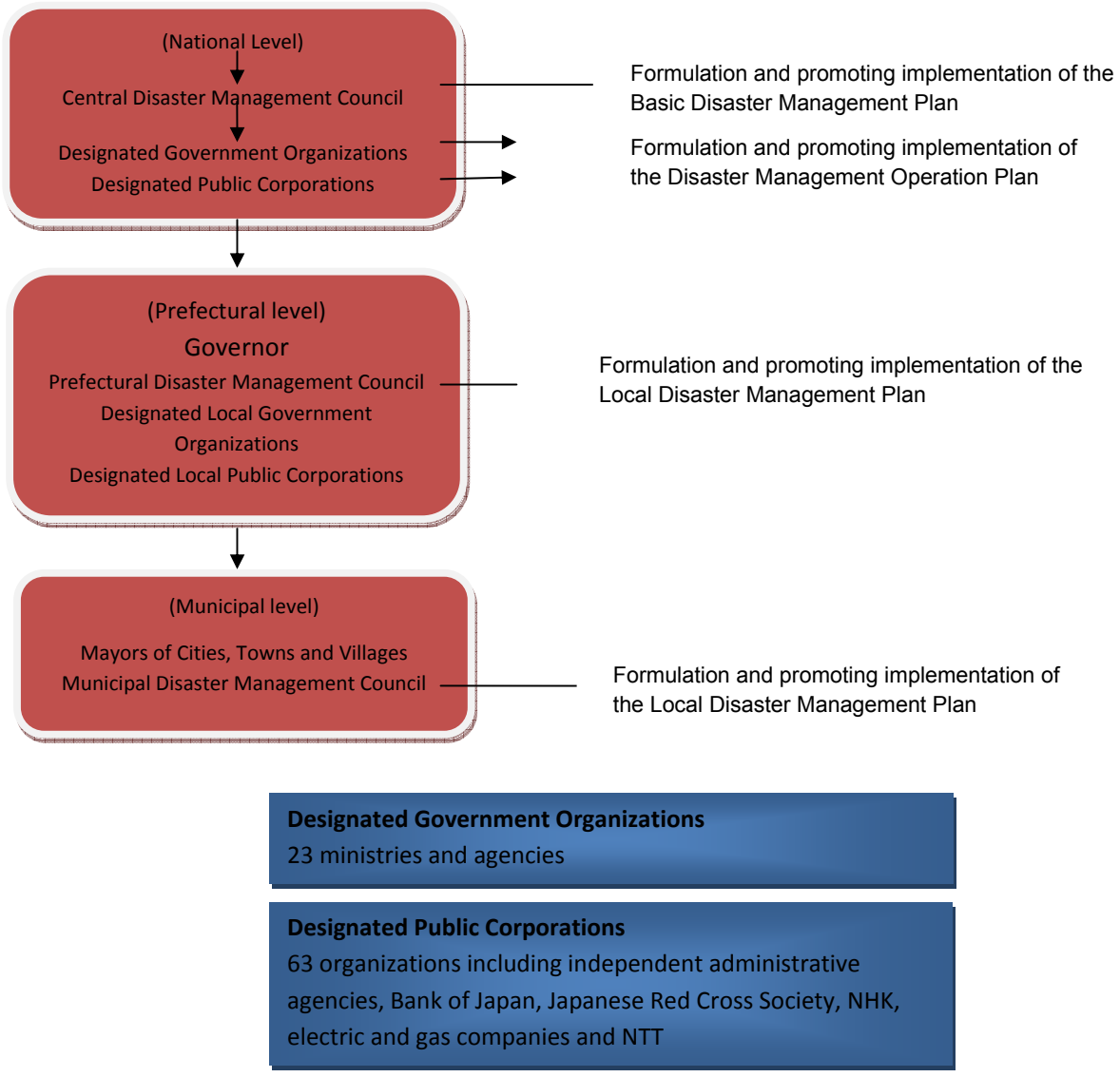
	EVENT	Disaster Management Acts	Disaster Management Plans and Systems
1940	45-Typhoon Makurazaki 46-Nankai Earthquake 47-Typhoon Catharine 48-Fukui Earthquake	47-Disaster Relief Act 49- Flood Control Act	
1950	59-Typhoon Ise-wan	50-Building standard Law	
1960	61-Heavy snowfalls 64-Niaagata earthquake	60-Soil Conservation and Flood Control Urgent Measures Act, 61- Disaster Countermeasures Basic Act 62- Act on Special Financial Support to Deal with Extremely Severe Disasters 62-Act on Special Measures for Heavy Snowfall Areas 66-Act on Earthquake Insurance	61-designation of Disaster Reduction Day 62 - Establishment of Central Disaster Management Council 63- Basic disaster management plan
1970	73-Mt. Sakurajima Eruption Mt. Asama Eruption 76-seismological Society of japan's of possibility of Tokai Earthquake 78-Miyagi-ken-oki Earthquake	73-Act on Special Measures for Active Volcanos 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 81-Amendment of Building Standard Law	83-Designation of disaster Reduction Week Campaign
1990	95-Great Hanshin-Awaji Earthquake 99- Torrential Rains in Hiroshima JCO Nuclear Accident	95- Act on Special measures for Disaster Countermeasures Act on Promotion of the Earthquake – proof Retrofit of buildings Amendment of act on special Measures for large-Scale Earthquakes 96-Act on special measures preservation of rights and profits of the victims of specified disasters 97- Act on Promotion of disasters Resilience Improvement in densely inhabited areas 98- Act on Support for Livelyhood recovery of Disaster Victims 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 04-Niigata-Fukushima Torrential Rains 04-Niigata-ken-Chuetsu Earthquake	00-Act on Promotion of sediment Disaster Countermeasures for sediment Disaster Prone Areas 01-Amendment of Flood Control Act 02-Act on special measures for promotion of Tohnankai and nankai Earthquakes Disaster management 03-Specified urban river Inundiation Countermeasures Act 04 – Act on Special measures for Promotion of Disaster Management for Trenchtype Earthquakes in the vicinity of the Japan and Chishima Trenches 05-Amendment of Flood control Act Amendment of Act on Promotion of sediment Disaster Amendment of Act on Promotion of the Earthquake –proof Retrofit of Buildings 06- Amendment of Act on theRegulation of Residential land development	01-Establishment of Cabinet Office 03-Policy Framework for Tokai Earthquake Policy Tokai Earthquake Countermeasures Basic Plan 04-Tonankai and Nankai Earthquake Countermeasures Basic Plan 05-Tokai Earthquake Disaster reduction strategy Tonankai and Nankai Earthquake Disaster Reduction Strategy Policy Framework for Tokyo Inland Earthquakes 06-Policy Framework for Trench-type Earthquakes in the vicinity of the Japan and Chishima Trenches Tokyo Inland Earthquake Disaster Reduction Strategy Basic framework for promoting a Nationwide Movement for disaster Reduction 08- Disaster Management strategy for trench-type Earthquakes in the Vicinity of Japan and Chishima trenches 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） 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. Disaster management system of Japan has undergone tremendous advancement throughout the past 5-6 decades while disaster management system of particularly Hyogo prefecture incredibly improved after The Great Hanshin–Awaji Earthquake 1995. This disaster is possible to be considered the turning point for advancement of disaster management system of Hyogo prefecture.

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.

Outline of the disaster management system of Japan



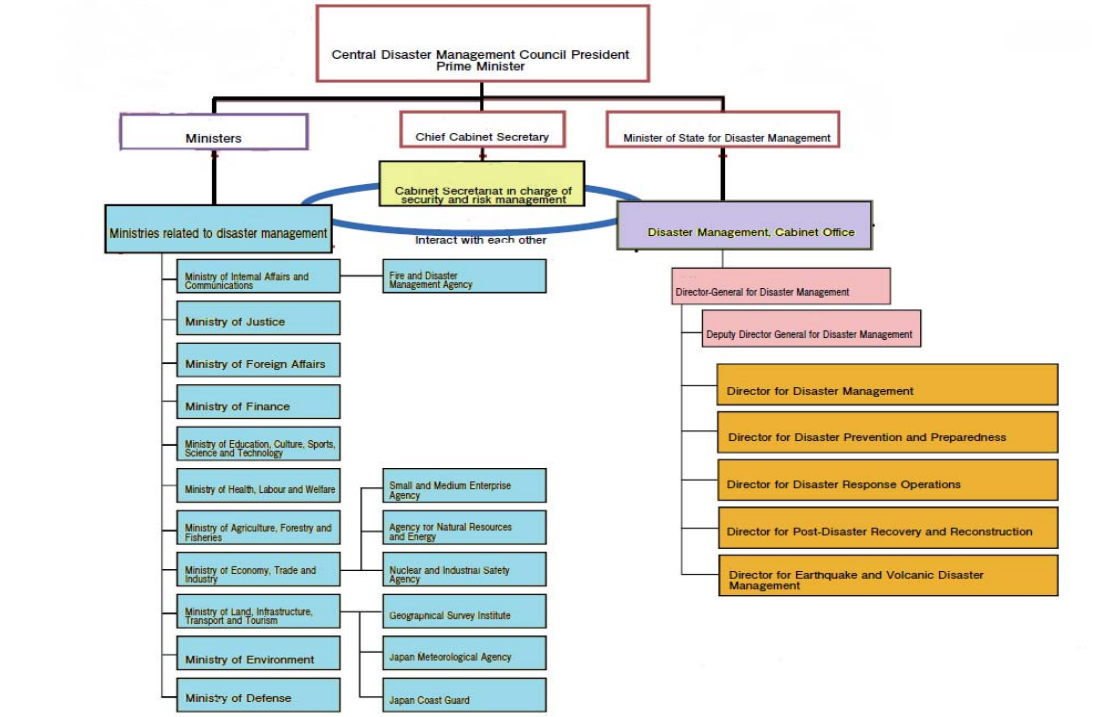
Central Disaster Management Council consists of the prime minister, who is the chairperson, Minister of State for Disaster Management , all ministers, heads of major public institutions and experts. The council promotes comprehensive disaster countermeasures including deliberating important issues on disaster reduction according to requests from the Prime Minister or Minister of State for Disaster Management. 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.

Additionally, taking into account lessons learned from the Great Hanshin-Awaji Earthquake, the Cabinet Secretariat System was strengthened, including the appointment of the Deputy Chief Cabinet Secretary for Crisis Management and the establishment of the Cabinet Information Collection Center, to strengthen risk management functions to address emergencies such as large-scale disasters and serious accidents. Thereby, the Cabinet Office has a role in supporting the Cabinet Secretariat regarding disaster management matters.

Organization of National Government and Cabinet Office (Disaster Management)

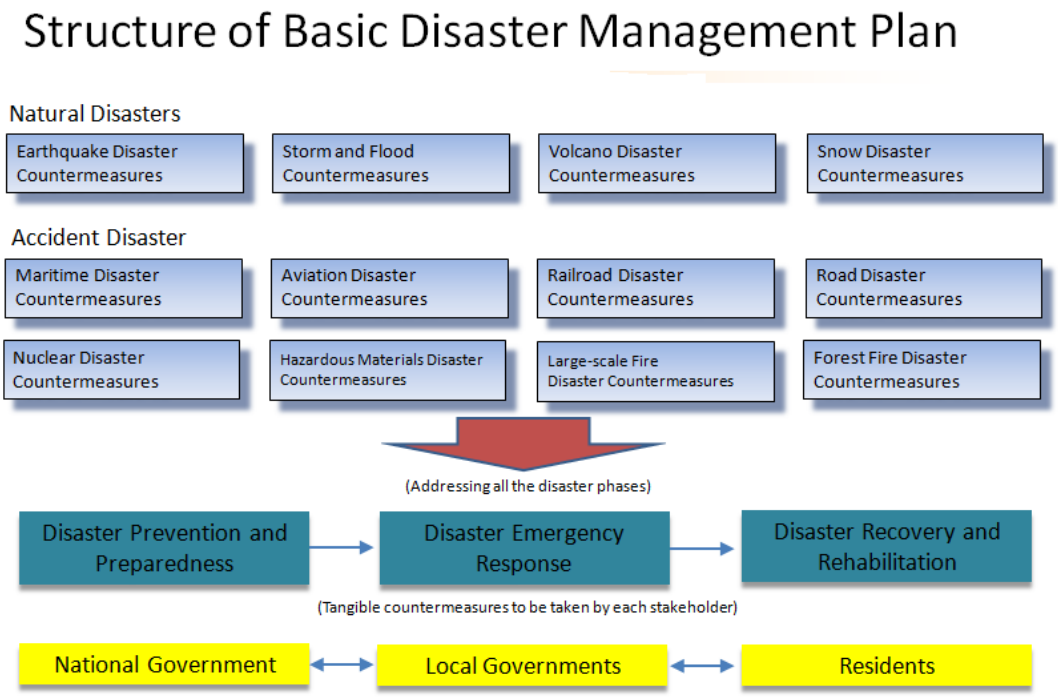


Disaster management planning in Japan is implemented at three levels:

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.

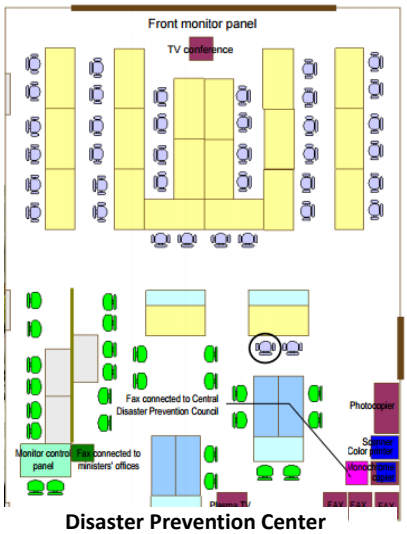
Designated local public corporations means administrators of other public corporations operating in the area of a prefecture and engaged in power, gas, transportation, communication and other public utility work, all designated by the governor of the prefecture concerned.

CURRENT OUTLINE OF DESIGNATED NATIONAL AND LOCAL ADMINISTRATIVE ORGANS, PUBLIC CORPORATIONS AND VOLUNTARILY ORGANISATIONSRESPONSIBLE FOR DISASTER MANAGEMENT IN JAPAN. THEIR TASKS AND RESPONSIBILITIES DURING DISASTER

THE MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM

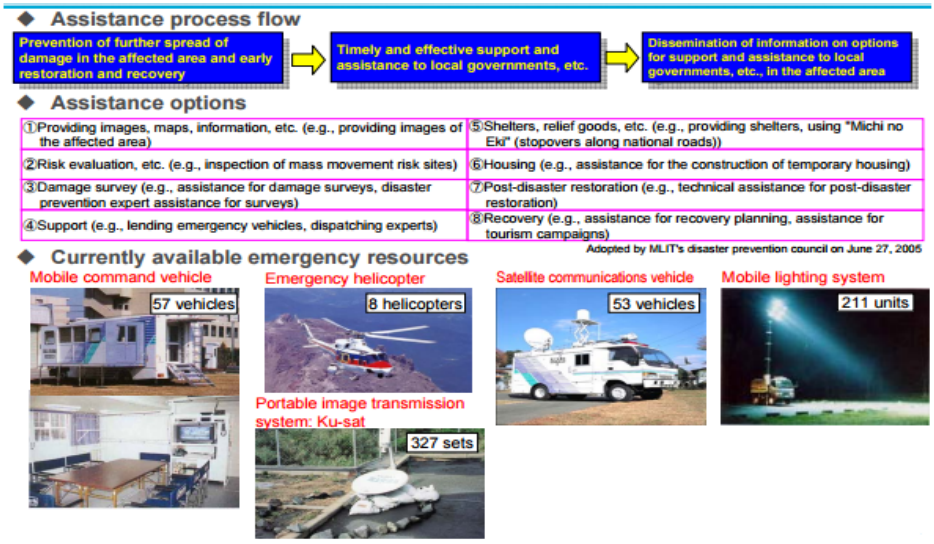
The MLIT conducts disaster management policy at national as well as prefectural level in relation to flood and sediment disasters as well as town development with regard to safety for both natural and technological disasters. Alongside with other phases of emergency management the ministry also actively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


MLIT's disaster prevention center



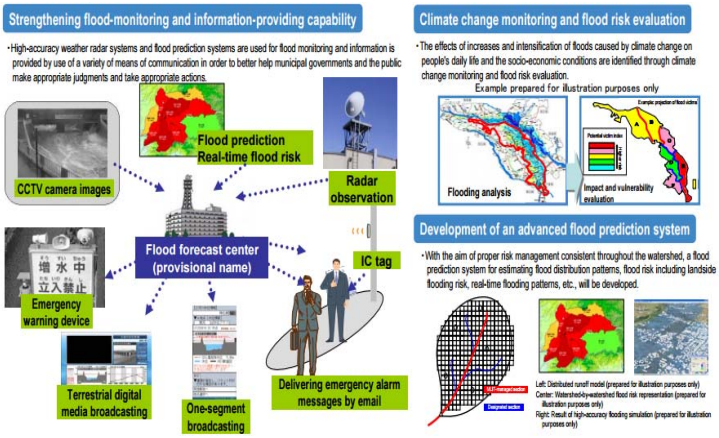
Disaster Prevention Center

- 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 response by MLIT

In order to minimize victims to the less possible extent and achieve the "zero victim" goal in the face of increasingly intense floods and localized heavy rains caused by climate change, **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:



Implementation of flood forecast centers

- 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. The radar data are calibrated using the ground data.

- 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.

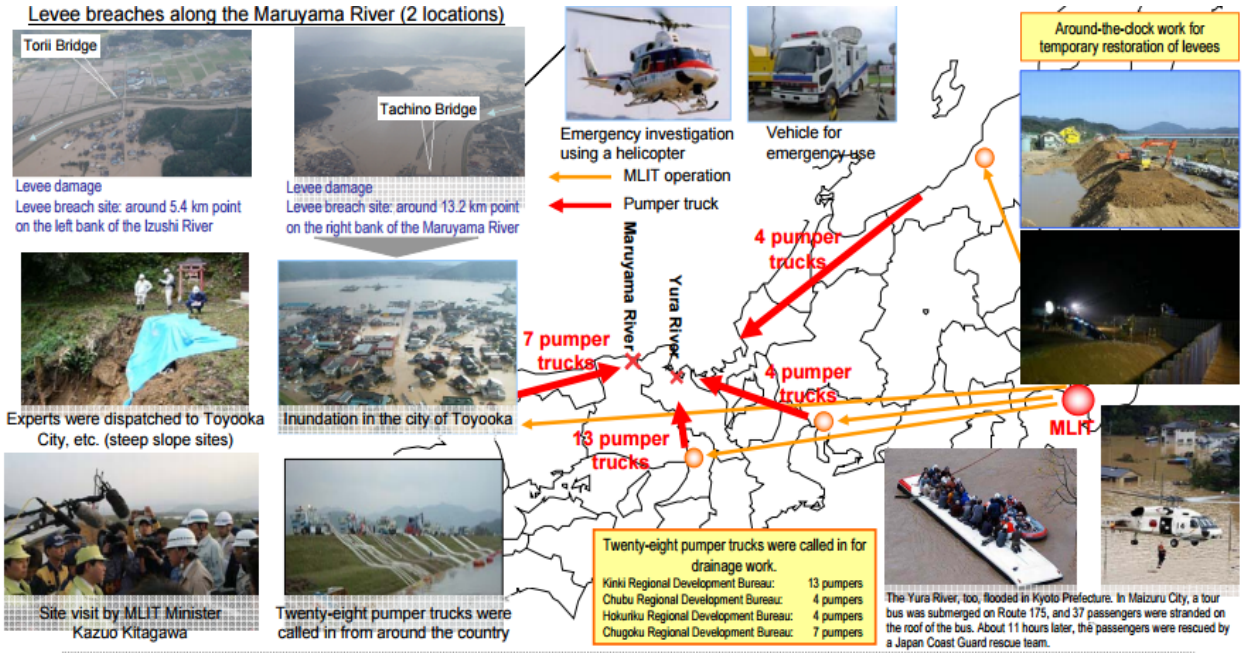
Fiber-optic network - River Bureau and Road Bureau have jointly laid fiber optics network lines with the total length of 12046 km (as of 2006).

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.

Case study: MLIT-managed Maruyama River

On October 20, 2004, Typhoon No. 23 caused serious damage in Hyogo Prefecture and the northern part of Kyoto Prefecture. River levees were breached at several locations. For the MLIT-managed Maruyama River, where flood damage was particularly severe, temporary restoration works were carried out with the assistance of nearby regional development bureaus in order to guard against future flooding. Temporary restoration works at two sites were completed in five days.

Temporary restoration of the MLIT-managed river sections (two levee breach sites) were



MLIT response to Maruyama River flood

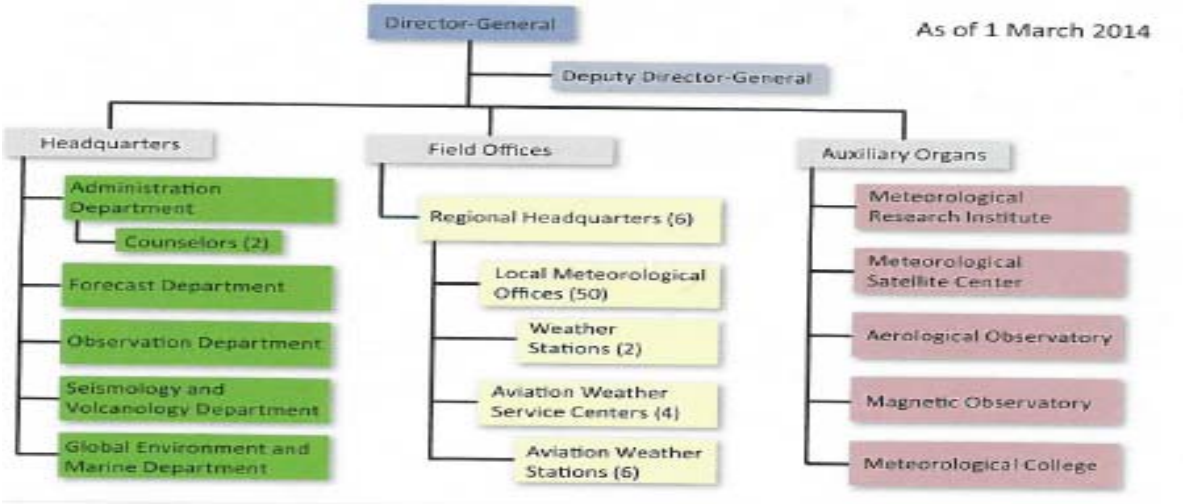
completed in five days with the assistance of nearby regional development bureaus.

The levee breaches in the sections managed by Hyogo Prefecture (four sites) were smaller than the breach sites in the MLIT-managed sections, but the temporary restoration of the four breached sections took 17 days.

JAPAN METEOROLOCICAL AGENCY

JMA's Headquarters

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. Regarding flood forecast Director-General of Japan Meteorological Agency (JMA) In the event of the imminence of a flood or storm surge, the Director-General of JMA informs the Minister of Land, Infrastructure, Transport and Tourism and the prefectural governors concerned of the present state.



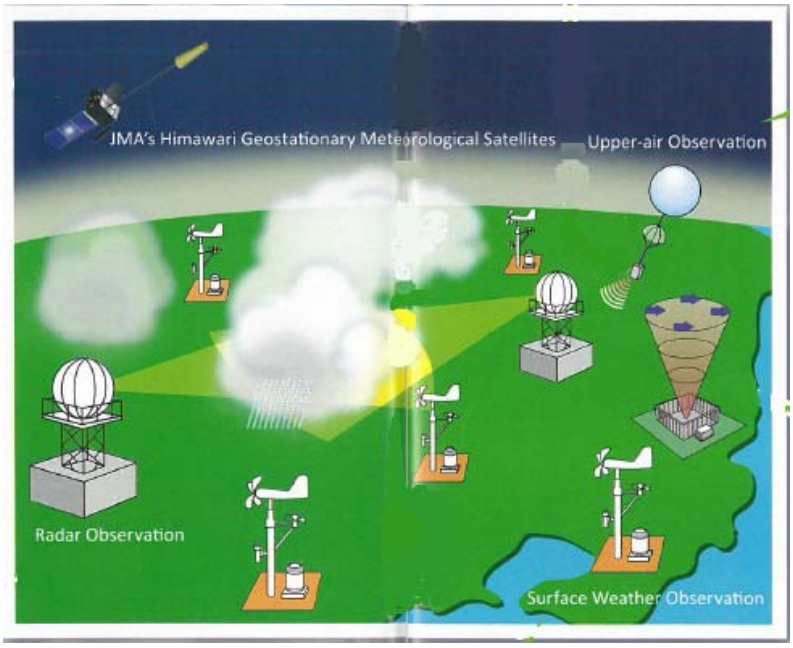
Organizational structure of JMA

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. The data produced are essential in clarifying atmospheric conditions, and are used for daily weather forecasts, severe weather monitoring, typhoon analysis and climate change monitoring

- **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**



OBSERVATION NETWORK OF JMA

- 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

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**

Forecasters use various weather maps to determine future weather conditions

- **Monitoring**

Forecasters monitor changes in weather conditions such as torrential rain, tornadoes and thunderstorms to enable the issuance of appropriate weather information that will help mitigate the effects of natural disasters

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 issued as:

- **Emergency Warnings/Warnings/ Advisories**

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

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

by JMA

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 Nowscasts (Precipitation, Thunder and Tornado)**

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:

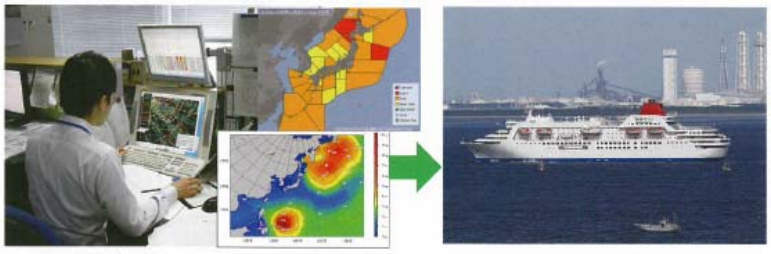
- Along with Japan's Ministry of Defense observe greenhouse gases in seawater
- Extreme climate events around the world and related phenomena such as El Nino and La Nina
- Atmospheric environment
- The oceans (water temperature, salinity, carbon dioxide)

Global environment observation network

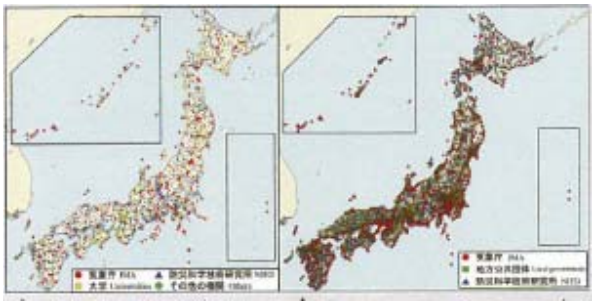
Meteorological Information for Aviation and Maritime Safety

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



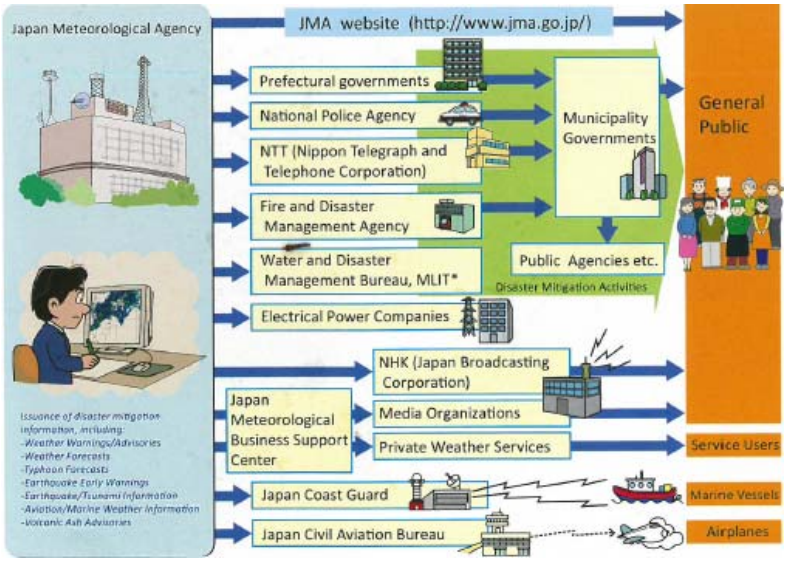
Seismometer and seismic intensity meter network

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.

Volcano monitoring system

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).

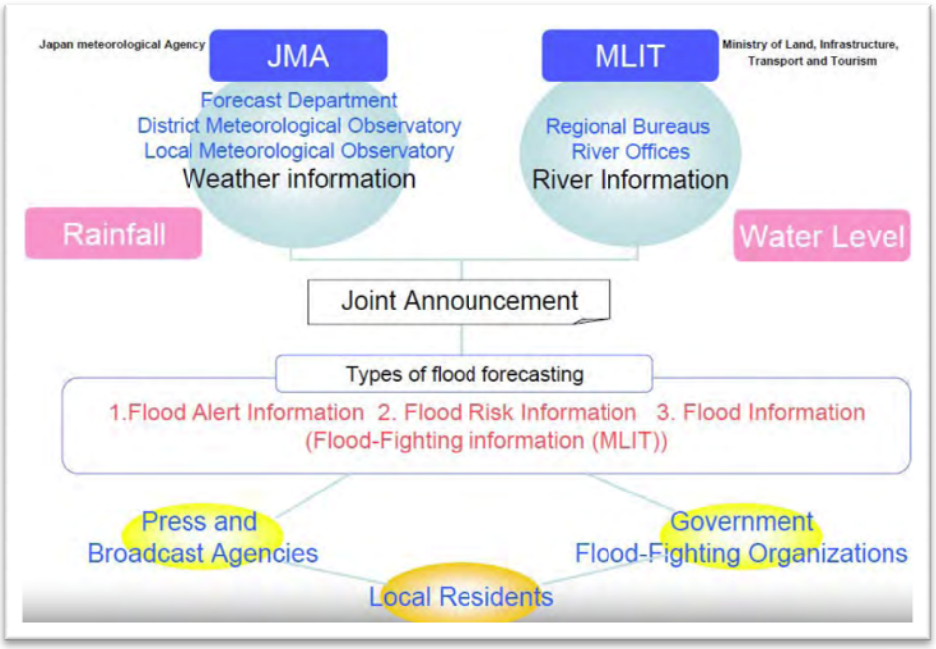


Cooperation of JMA with other organizations

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.

Prefectural governors communicate the information received as described above to the flood protection managers and stage gauge managers.



Joint flood warning by MLIT and JMA

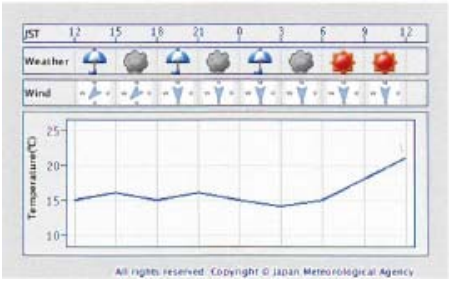
JMA provides **daily forecasts/one-week forecasts** (information on weather, winds, coastal ocean waves, maximum/minimum temperatures and probabilities of precipitation) covering periods **up to two days /up to seven days ahead**. They include Distribution Forecasts and Three-Hours Forecasts.

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

2 days ahead forecast issued by JMA



three-hourly forecast

It is JMA which designed and apply Earthquake Early Warning System after the Great Hanshin-Awaji Earthquake

Earthquake

A matter of seconds

Earthquake Early Warnings

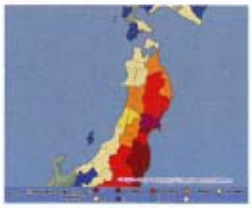
Earthquake Early Warnings (EEWs) provide advance notice of estimated seismic intensities and expected arrival times of principal motion just after an earthquake occurs. If the estimated maximum seismic intensity is 5-lower or more, EEWs (warnings) are issued for regions with estimated seismic intensities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

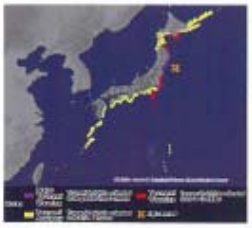


2 to 3 minutes

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.

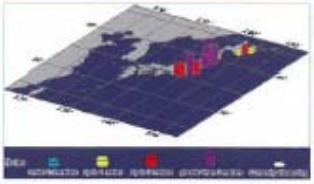


* Major Tsunami Warnings are issued in the classification of Emergency Warnings. → p. 1, 2

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

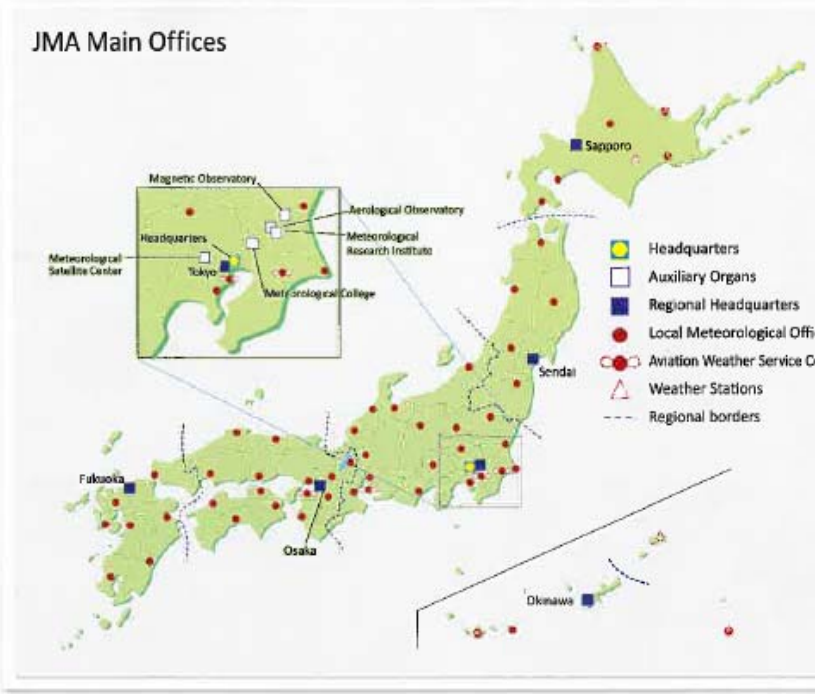
This information specifies the tremor's hypocenter and magnitude. It also identifies cities/towns/villages where seismic intensity levels of 3 or greater have been observed and those where the estimated seismic intensity is 5-lower or greater but related observation data are incomplete.

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.



JMA Main Offices

JMA Kobe Office

JMA operates the Sapporo, Sendai, Tokyo, Osaka, Fukuoka and Okinawa Regional Headquarters to observe and monitor weather and earthquakes and to issue forecasts, warnings and bulletins for these regions. The Regional Headquarters give direction to Local Meteorological Offices for the issuance and provision of information and comments on prefectural and municipal levels. The Agency operates Aviation Weather Service Centers at major airports to support the safe flow of air traffic.

JMA also operates the Meteorological Research Institute, the Meteorological Satellite Center, the Aerological Observatory, the Magnetic Observatory and the Meteorological College as location to research.

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. To this end it provides, it provides municipalities with advice, guidance and recommendations concerning their fire service organizations and activities. It however does not have the power to control such organizations and activities. Below are the main affairs under the jurisdiction of the FDMA:

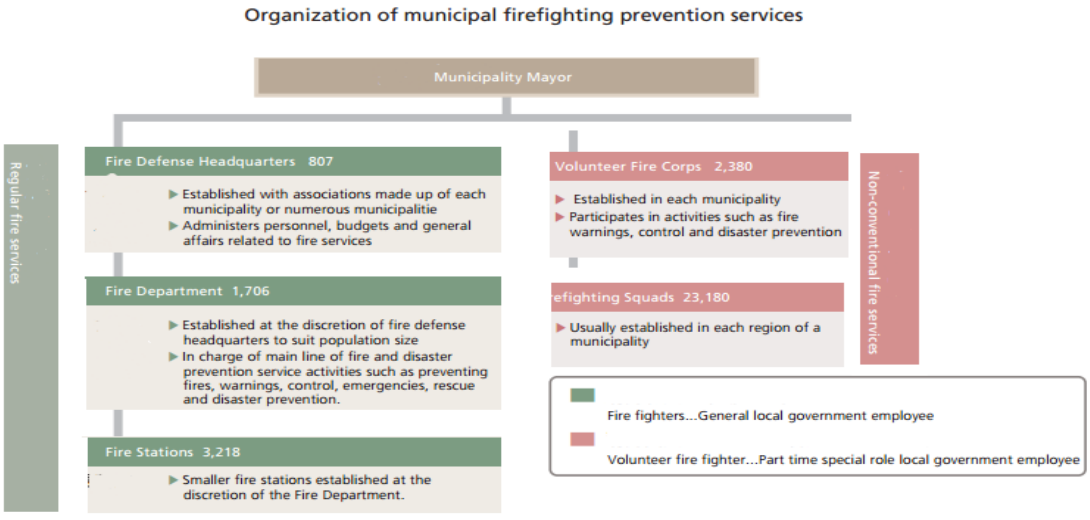
- Planning and formulation of the overall fire service system
- Guidance for and assistance in strengthening fire service facilities

- 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

The FDMA also functions as a contact center between local fire-defense related organizations and government and coordination body during the large scale disasters and accidents

The role of FDMA during disaster and peace time

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 most familiar to the public, and are controlled under the jurisdiction of municipality mayors



By expanding the size of municipality fire services, the fire service system can be better organized and enhanced. Accordingly, municipal fire services are being spread out to offer local residents improved services.

Volunteer fire corps operates in every town and city of the country, boasting outstanding mobilization and response capabilities. Every member of the volunteer fire corps has their own regular job, but are active days or night protecting their own town by themselves, deeply rooted in the spirit of their devotion to their hometown. 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, as well as rejuvenating their local community. 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.

Firefighting under the coordination of fire fighters

Home visits to elderly people

Children learning firefighting techniques

Volunteer fire corps pump competition

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

In the case of large-scale disasters when firefighting organizations cannot cope alone, elite emergency rescue teams of the FDMA, known as, **Emergency Fire Response Teams** assist them.

Leader of the municipal teams supervise municipal teams and manage their activities whereas the Leader of the Command Support Group 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 Commissioner of the Fire and Disaster Management Agency 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. As of 2004, 2800 Emergency Fire Response Teams has been registered across the country covering about 15 % all fire brigades in Japan. 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

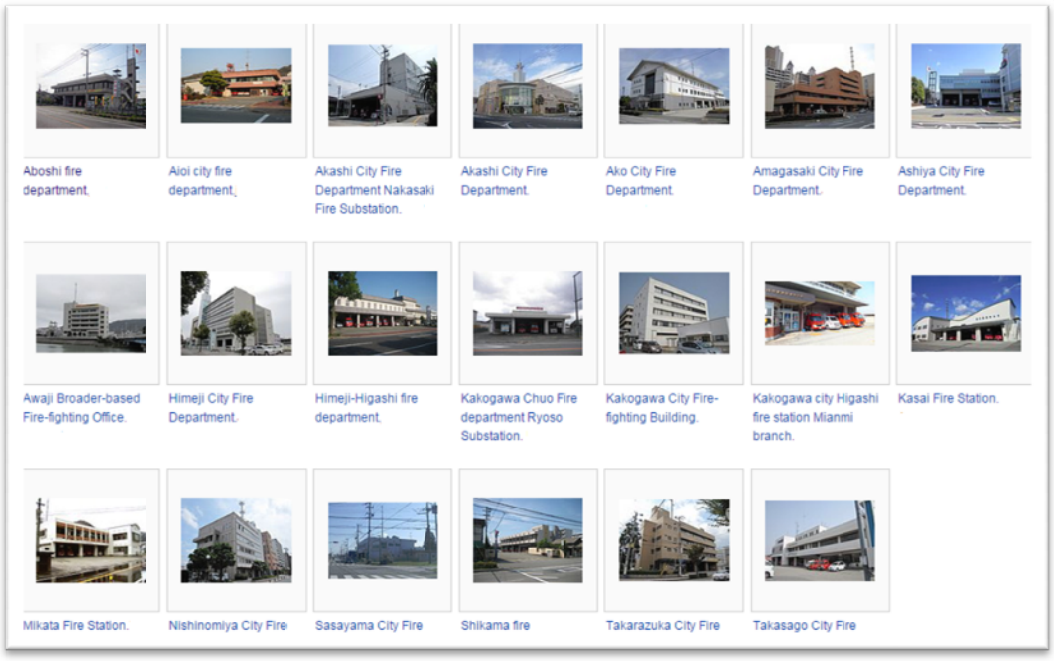
Emergency Fire Response Teams was founded in 1995, after the Great Hanshin-Awaji Earthquake and institutionalized by the Fire Defense Organization Law as amended in 2003.

Water Flooding Rescue Effort

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

Traffic accident rescue efforts

Fire Stations in Hyogo Prefecture



Case Study – Kobe Fire Department

Overview of the Kobe Fire Department (As of 2015)

1. Outline of Kobe City

(1) Surface area: 553.12 km2
(2) Population: 1,536,559 people
(3) The number of households: 695,408 households

2. Status of Kobe Fire Department

(1) Organization
Fire Department Head Quarters (1), Fire Stations (10), Fire Station Division (1), Fire Station Branches (18), First Aid Station (1), Air Rescue Squad (1), Citizen disaster prevention center (1), Emergency stations (1)
(2) Number of employees: 1,396 people (quorum)
(3) Number of resources, such as fire engines (total: 93 units)

・ Number of fire engines: 93 units (Pumpers, Pumpers with foam, Aerial ladders, Rescue tracks, Special disaster response vehicle, etc.)

・ Number of ambulance: 36 units

・ Number of other vehicles: 63 units (vehicles for inspection and public relations, transportation vehicles, etc.)

・ Fireboat: 1 unit

・ Aircraft (Helicopter): 2 units **Fire Fighting Water Source Facilities** (Total: 33,521 units)

(1) Number of hydrants: 29,936 units
(2) Number of tank for firefighting: 2,257 units (of the number of earthquake-proof tank: 259)
(3) Number of other water source facilities: 1,328 (pools, ponds, rivers, etc.)

4. Number of reported receiving of "119" call: the number of reports 119 -132,350 (2014), the number of reports from cell phone – 55,377

Fire	Emergency	Other disasters	Contact the firefighting	Training test	Mistake No response	Hospital inquiry	Inquiry Advisor	Other	Forward
856	77,582	3,123	2,138	5,450	13,725	13,186	8,960	5,526	1,804

5. Status of Fire in 2014

・ Number of fires: 856

8. Status of Voluntary Disaster Prevention Organizations (BOKOMI)

・ Already formed: 191 districts (all over the city & school districts)

9. Status of Volunteer Fire Corps

(1) Organization: headquarters (10), Divisions (15), Sub-divisions (159)

(2) Number of members: 4,000 (quorum)

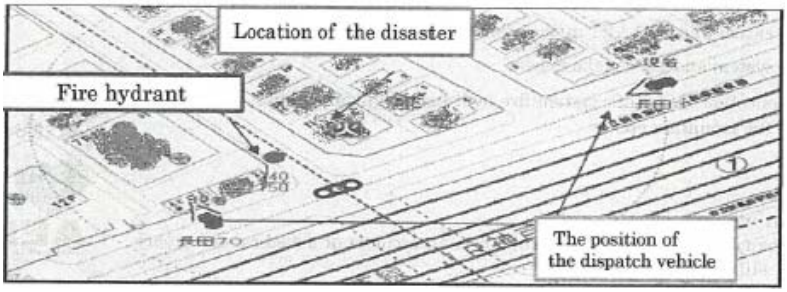
Operation room of the Kobe Fire Department serves as a coordination and emergency hotline center. Based on a 119 emergency call received in the operation room relevant response teams are dispatched to accident site. Once a call received automated system identifies and displays caller's data and exact location at the digital map. Overall following activities of dispatched teams take place under supervision and coordination of the Operation Room. In order to ensure that all incoming calls are received 126 telephones lines are being utilized. In addition, 5

surveillance cameras to ensure safety situation at strategic places are managed by the Operation Room, meteorological situation in Kobe City area, National Broadcasting Channel – NHK are observed.

For the purpose of coordination of emergency medical service daily information on medical staff shifts, vacant rooms, etc are received from designated hospitals.

Moreover, the department has taken some measures in order disabled and aging persons to be able to call 119 hot line easily. To this end special fax sheets, landline telephones which enable one to call 119 hot line with the click of just a button has been elaborated – or ordinary landline telephones reconfigured to support the same function - and distributed to registered persons. Once such a call received all the personal and health data are displayed automatically.

Screens using in Command



Automatic Vehicle Monitor

JAPAN COAST GUARD

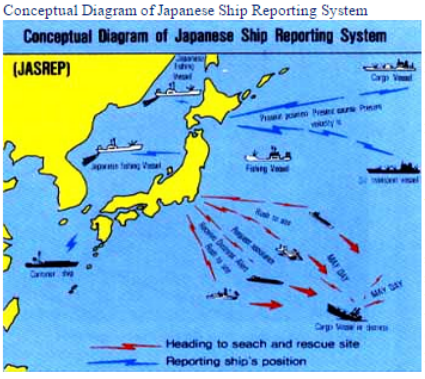
Alike the JMA, Japan Coast Guard (the JCG) is the external organ of the MLIT. The main responsibilities of JCG in terms of disaster preparedness and marine search and rescue include:

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

Conceptual Diagram of Japanese Ship Reporting System



Japanese Ship Reporting System(JASREP) JASREP makes it possible to conduct quick and appropriate search and rescue activities when a maritime accident occurs. It does this by monitoring the movements of vessels through the use of computers to control information provided by vessels, such as their sailing plans and position reports during their voyage.

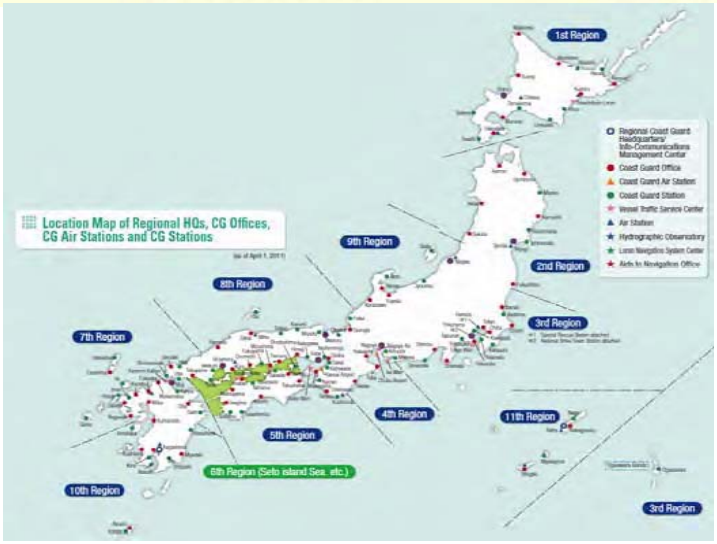
Disaster preparedness and marine search and rescue – it is the responsibility of JCG to conduct search and rescue operation once accident such as boat/vessel involved accidents occur. The JCG works to raise awareness and educate people about the dangers of the sea and the principles of self rescue. It also makes every effort when accidents do occur to respond promptly and save lives. The JCG is increasing its deployments of mobile rescue personnel skilled at descending from helicopters and bringing people back up, scuba diving, and providing emergency first aid treatment. It is also working to improve the rescue and first-aid capabilities of its divers and emergency medical technicians. 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.

Calls from landline are received by the respective regional centers, whereas, the calls from onboard phones are directed to headquarters.

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. This provides the JCG with a system that is always ready to mobilize and is also useful for such tasks as predicting how an oil spill will spread and drift in order to allow its effective removal. The JCG also works for maritime disaster prevention by conducting exercises with private-sector disaster prevention organizations in Japan and

overseas. The JCG makes every effort to keep its systems in good order and conducts drills so that when a major natural disaster occurs it is ready to quickly carry out such emergency relief operations as rescuing disaster victims, providing emergency transportation for personnel and relief supplies, and conducting surveys of stricken areas. The JCG compiles “coastal area environmental protection information” so that when oil spills occur their environmental impact can be promptly assessed and analyzed and their damage minimized. This information is made available over the Internet so that it can be put to use by organizations involved in oil removal as **well as local municipalities and private-sector groups.**

Central and Regional Organization Of JCG

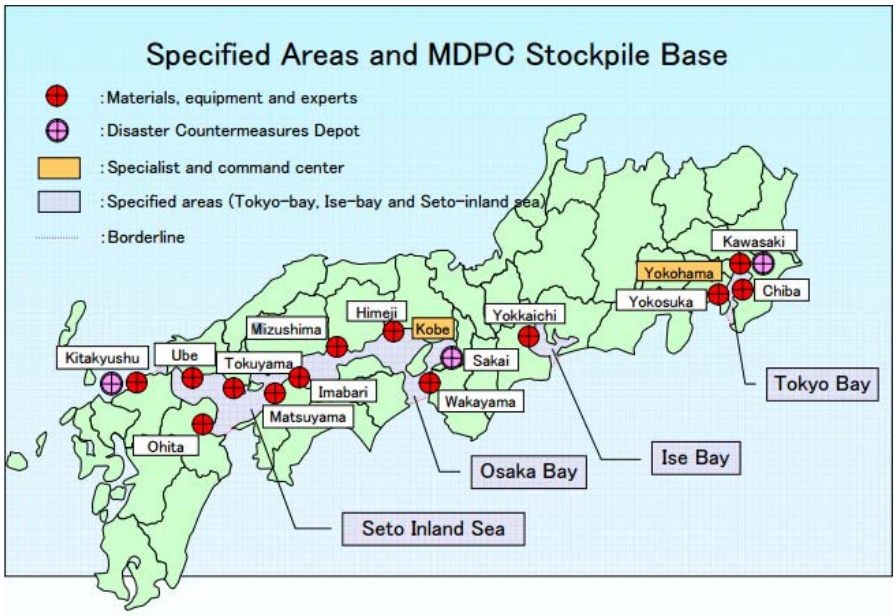


Regional Centers of JCG

Maritime Disaster Prevention Center

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 (Acceding

to the Japanese domestic law, “Oils” were divided into two categories such as “persistent oils” and “non-persistent oils” Persistent oil (= specific oil) includes crude oil, heavy oil, lubricating oil and etc. Non-persistent oil includes gasoline, kerosene, light oil, oil refuse and refined products etc.) 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, entrusted by the ship owner of the tanker and instructed by the Japan Coast Guard.



MDPC was established in 1976.

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. In Japan, the domestic law relating to the Prevention of Marine Pollution and Maritime Disaster was revised in 2006 due to accession to the Protocol on Preparedness, Response and Co-ordination to Pollution Incidents from Hazardous and Noxious Substances, 2000”(OPRC-HNS Protocol). The following is a part of the provision of this revised law. Since April 1st 2008, when the owner of HNS tankers of more than 150GT sails in specified areas (Tokyo-bay, Ise-bay and Seto inland sea) while carrying HNS, the owner has to keep onboard appropriate accident response materials, equipment and experts necessary for removal of the said HNS, and be able to reach the site with such materials, equipment the location of the said vessel within approximately two hours. Depending on the characteristic of the HNS, it is necessary to keep the removal materials or vessel with capability to squirt water, oil boom, oil skimmer etc, and keep the experts.

When the owner of the vessel, is sailing in the specified areas when carrying cargoes of HNS, the owner has to have the certification of accident response materials, equipment and experts.

SELF-DEFENSE FORCES (SDF)

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. In particular, over 100,000 SDF personnel were dispatched at a peak time for relief operations for the large-scale earthquake and nuclear disaster based on the Great East Japan Earthquake in March 2011.

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 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). The Minister of Defense is authorized to dispatch SDF once earthquake or nuclear threat alarm is issued, based on the request of Chief of the Nuclear Disaster Countermeasures Headquarters and Chief of the Earthquake Disaster Warning

Activities of SDF units in 1995

Headquarters (both–the Prime Minister) The Self-Defense Forces (SDF) conducts a variety of activities when disaster relief dispatches are required, including search and rescue for accident victims and ships or aircraft in distress, flood control, medical treatment, epidemic prevention, water supply and transportation of personnel and goods. The SDF make it a principle to dispatch SDF units upon request from prefectural governors and other officials.

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.

From the Kobe Earthquake lessons, The Minister of Defense or those designated by the Minister of defense may dispatch SDF units without a request in exceptional circumstances when the situation is particularly urgent and there is no time to wait for a request.

MUNICIPAL LEVEL VOLUNTARY EMERGENCY RESPONSE TEAMS

VOLUNTARY FIREFIGHTING CORPS - Likewise the fire departments and stations, volunteer fire corps in Japan also are organized by municipalities. Different from the first two, volunteer fire fighters are not professionals and engaged in fire fighting as secondary occupation. 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. However, there are municipalities that have established more than one corps (most of “designated cities”) and those that have not established the corps (Osaka city, and some towns and villages in Aichi Prefecture).

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

SUIBO-DAN is at drill

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.

Voluntary disaster prevention groups

According to article 7 of DISASTER COUNTERMEASURES BASIC ACT residents of the area under local government are obligated to contribute toward the cause of disaster prevention by taking their own measures to prepare for disaster and by participating in voluntary disaster prevention groups

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

BOKOMI drill

BOKOMI – BOKOMIs 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. To establish BOKOMI, firstly, it is discussed and decided on by local government organizations including the local city office and the local fire station, together with leader of 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. Schools in Japan also serve as evacuation sites during 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.

EMERGENCY RESPONSE BY OTHER ORGANIZATIONS AND TEAMS

DISASTER MEDICAL ASSISTANCE TEAMS

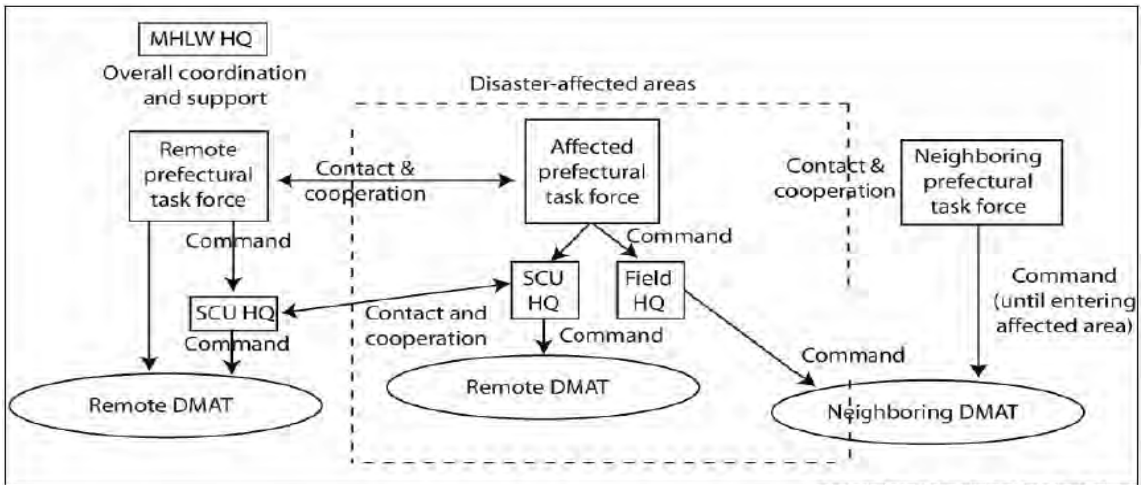
Disaster Medical Assistance Teams are specialized and trained medical aid teams which operate during large-scale disasters. DMAT system was established in 2005 based on the lessons of Great Hanshin Awaji Earthquake. The guidelines for the deployment of DMATs are based on the results of research funded by a Health and Labor Sciences research grant from the, the Ministry of Health Labor and Welfare (MHLW). In these guidelines, 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.

The role of each institution affected by these guidelines is:

1. Prefectures: a. *Non-emergency times*—formulate operational plans, conclude agreements with medical institutions, and provide training; b. *Emergency times*—Deploy DMATs and provide necessary support for relief activities. The prefectures must assume the central role.
2. MHLW: a. *Non-emergency times*—produce operational guidelines, certify personnel, promote education and training; and b. *Emergency times*—collect information; overall coordination.
3. DMAT-designated medical institution: a. *Non-emergency times*—prepare for deployment, train personnel; and b. *Emergency times*—Dispatch DMATs on request.
4. *Emergency base hospitals, Japanese Red Cross Society, and the National Hospital Organization*—provide necessary support (collect information, provide contacts, coordination, personnel, and materials)

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 unless the one following conditions is not the case



Outline of DMAT Operations

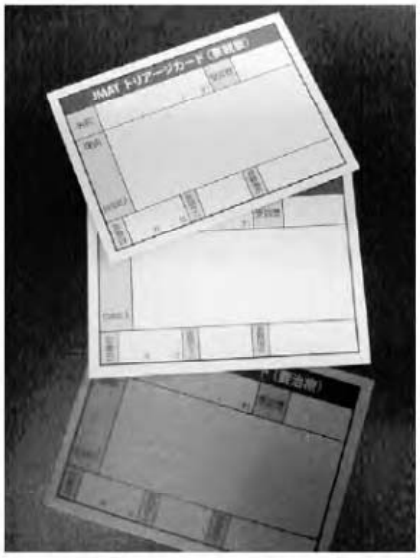
JAPAN MEDICAL ASSOCIATION TEAMS – JMAT

The concept of JMAT had been building up since 2009 by a subcommittee of the Japan Medical Association's Committee on Emergency and Disaster Medicine. For the first time, JMAT came into action in March 2011, when the Great East Japan Earthquake occurred. Triage cards were prepared by the Japan Medical Association for JMAT activities in the Great Eastern Japan Earthquake. Different from triage tags used during the acute phase of a disaster, 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. Also, the checklists were prepared for each evacuation shelter to enable the easy sharing of information when presiding

at the joint conferences held locally every morning and evening, mainly at the local municipal medical associations. Over 230 such teams are currently organized.

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



(From top) White card: needs observation, Yellow card: needs attention, Red card: needs treatment

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, responding to patients at home, clarifying medical needs, identifying locations where medical support is not available and making rounds in such areas, collecting local information and supporting the efforts to organize coordination meetings for relevant parties in disaster zones. Passing on duties smoothly to reconstructed medical institutions (including local medical associations) in affected areas is also an important activity.

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. In fact, after the Great East Japan Earthquake, other professionals such as pharmacists also played significant roles

Dispatching duration of the team: Approximately three to seven days (depending on discussion with supported sites and supporting associations)

6. Communication method with JMA: Mobile phone

Case study – Medical relief activities by Hyogo JMAT in Ishinomaki City

When the disaster 2011 occurred JMAT Hyogo was dispatched to the affected areas of Ishinomaki, the second-largest city in Miyagi Prefecture with a population of approximately 160,000 as part of the activities of the local government.

Medical activities at the first-aid stations were carried out for about three months, from March 21 until June 19, 2011. The activities of Hyogo JMAT started at the Ishinomaki Junior High School with 700 evacuees and then three more stations, followed by patient visits. JMAT Hyogo dispatched 44 teams in total to the disaster area. Each team departed by airplane in the early morning of the first day, stayed in the disaster zone carrying out medical activities for three days, and then left on the last flight on the third day. A total of 140 physicians were dispatched from Hyogo, with as many as six physicians required in a team. The number of JMAT team members totaled 312, including nurses, pharmacists, and coordination staff. The teams were organized with the cooperation of the secretariats of Hyogo prefectural nurses associations, pharmacists associations, and medical associations as well as municipal medical associations. First-aid stations had not been prepared beforehand. The first JMAT Hyogo team set up a first-aid station at the junior high school in consultation with the school principal. Every time physicians in specialist fields were dispatched, notices for evacuees were posted at the first-aid center in advance.

The staff of JMAT not only constructed a device for suspending the drips, but also secured food, water, and gasoline; negotiated with other relief teams; and made arrangements for flights and accommodation.

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 Society has undertaken a number of disaster relief activities at home since 1888, when it sent its first medical relief team to assist the victims of the Mt. Bandai eruption. The JRCS conducted disaster relief operations after the Great Kanto (1923), Great Hanshin Awaji (1995) and Niigata Chuetsu (2004) earthquakes, the Unzen-Fugen (1991) and Usu (2000) volcanic eruptions, and other natural disasters. The organization is also involved in rescue operations following transportation accidents, such as airplane and train crashes, and industrial disasters, such as gas explosions.

日本赤十字社
Japanese Red Cross Society

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.

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. To this end, the corporation has dedicated vast resources to disaster response and

Tsunami warning broadcasting by NHK

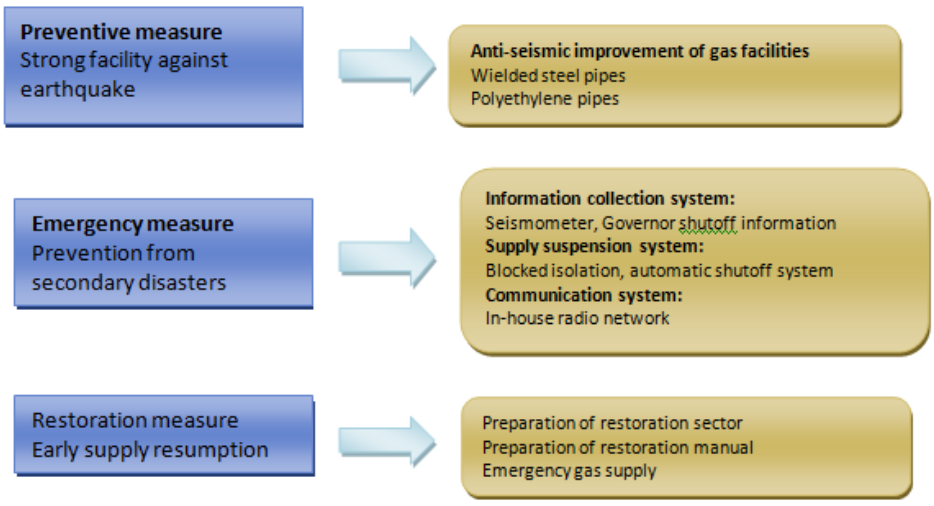
established effective coordination mechanism with other disaster management related organizations, mainly with the JMA. Small quakes detected the JMA before strong earthquake occurs, automatically redirected to NHK within a few seconds, (moreover, NHK has installed seismic intensity meters at 73 locations 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) utilized in collaboration the JMA 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 system switches on tv sets and radios – 4 tv channels and 3 radio channels belong to NHK - automatically. Since 1985 they EWS alert has been issued 18 times – all of them for tsunami warnings, while 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.

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.



Outline of the Osaka Gas Engineering Crises Management Measures

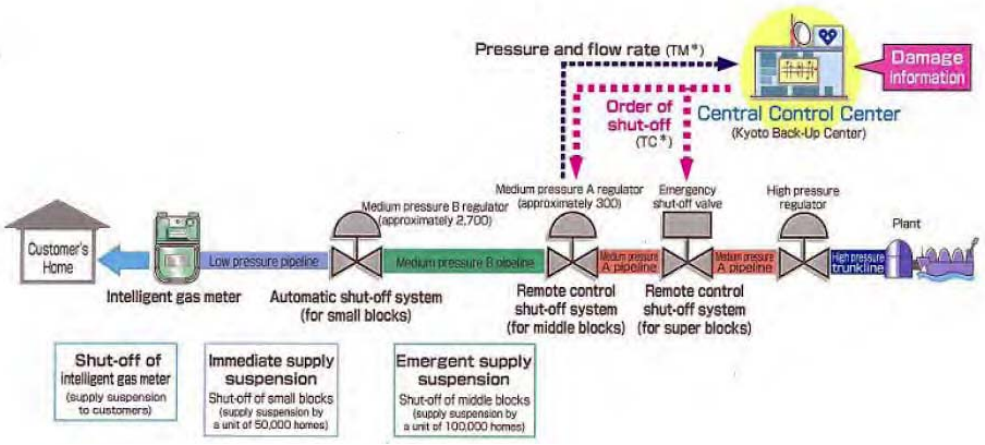
Emergency measures:

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 SI as an indicator of gas pipeline and structural damage. The seismometers are tied into an automatic shutoff system that triggers under high SI capable of causing damage in an earthquake.

Shut-off system

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

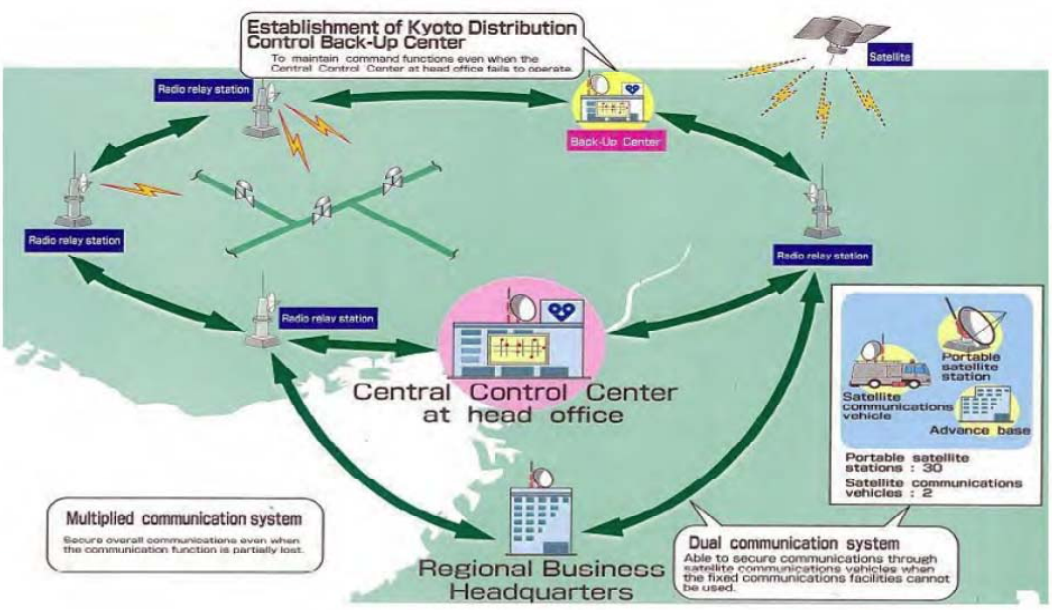


The Osaka Gas Engineering Automatic Shut-Off System

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



The Osaka Gas Engineering In-house Radio Network

supply 24-hours a day. Because around-the-clock operation is necessary as much in an earthquake as on a regular basis, Osaka Gas introduced a radio network that works by radio waves and satellite.

The Osaka Gas Engineering Back-Up Center

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 Control Center is capable of this, but should it be damaged, a Back-Up Center built with aseismic systems and other state-of-the-art technology for 24-hour operation can take over control.

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. One or more types of the teams are dispatched as appropriate

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

JAPAN DISASTER RELIEF TEAMS

To facilitate the rapid and reliable supply of the large-volume of relief items, reserve supplies must be procured and appropriately stockpiled in advance at locations as close as possible to disaster areas. Accordingly, 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. In cases where other types of supplies are required, JICA takes emergency action, including procurement in affected or neighboring countries. When requested, emergency medical supplies are procured from the United Nations Children's Fund (UNICEF) Supply Division in Denmark or the International Dispensary Association (IDA) in the Netherlands and are rapidly shipped to affected countries.

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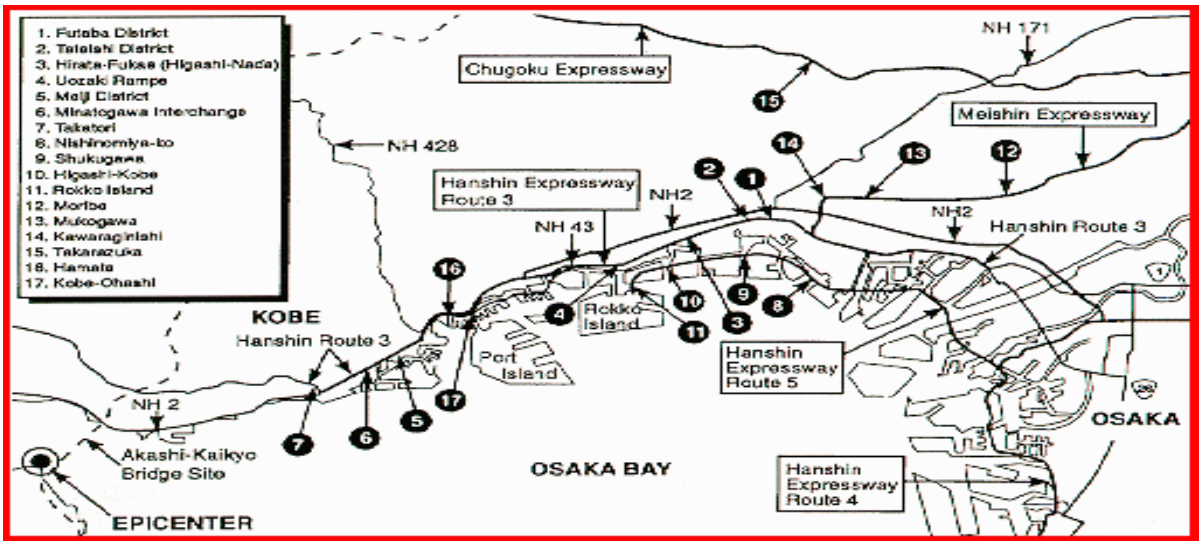
The Great Hanshin-Awaji Earthquake as a Turning Point of Improvement of Disaster management system of Japan as a whole and Disaster Management System of Hyogo Prefecture

SHORTCOMINGS AND FAILURES DURING DISASTER PREPAREDNESS AND DISASTER RESPONSE TO THE GREAT HANSHIN-AWAJI EARTHQUAKE



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

Among disasters occurred in recent history of Hyogo, the following are the ones with the largest amounts of human suffering: Typhoon Muroto (September 1934) that led to death toll of 281 and Injured 1,523, Heavy rain caused by the seasonal rain front (July 1938) brought to 731 death and 1463 injured I would like to highlight so-called The **Great Hanshin earthquake** (阪神・淡路大震災 *Hanshin Awaji daishinsai*[2]), or **Kobe earthquake** or Southern Hyogo Earthquake occurred on Tuesday, January 17, 1995, at 05:46 JST (January 16 at 20:46 UTC) in the southern part of Hyōgo Prefecture .
So January 17, 1995 the earthquake occurred that struck one of the world's largest port cities. Inner city problems such as densely populated urban areas with old wooden houses and very narrow streets intensified the severity of damage.
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

To comprehend the intensity of the earthquake below the Japanese scale earthquake is given:

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

Japanese Earthquake Scale

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 rnaximum number of evacuees at shelters was 316,678 on January 23; about 20,000 remained on June 30, About 60000 temporary housing units were planned and some were cornpleted as early as the second week after the earthquake. During these first two weeks, the number of residents rescued in Kobe City was 1,888 but these surviving only 733. The total number of fires in Kobe was 176, and the area burned about 70 ha. In terms of economic damage, the loss of property was 11.6 trillion ¥, 2.5% of the Japanese GDP {466 trillion ¥ in 1994).

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. The Great Hanshin-Awaji Earthquake exposed the wretched fragility of highly advanced urban infrastructures such as the artificially made Port Island and Rokko Island with modern port facilities, the network systems of railroads, subways and highways, and other lifelines systems that extended in a narrow zone along the coast.

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**.

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 (about 2.5 million containers) in 1993, and has been the country's largest container port (i its share was 30%). Damage to the port facilities include the severe collapse of 239 berths, of which 35 container berths collapsed due to liquefaction, and the members of the total gantry cranes used to load containers buckled due to intensive ground motion. All the container berths with a depth of 12m on Port Island and those with a depth of 14m en Rokko Island were broken due to liquefaction and strong earthquake motion. The estimated cost of the damage was 1.4 trillion yen. Maritime transport companies have since switched to such other domestic ports as Osaka and Yokohama and to foreign container ports such as Hong Kong and Pusan. If a new route for cargo distribution is established, attracting customers back to the old Kobe route will be difficult, By the end of April 1995, six container berths had been reopened, and one-third of the berths repaired. Before 1997, the other damaged berths will be usable.

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

Old wooden buildings collapsed during the Hanshin-Awaji Earthquake 1995

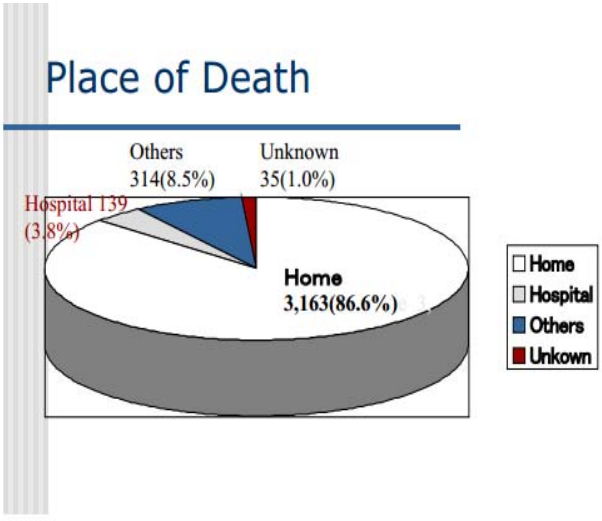
but those built according to the revised construction standards of 1981 did not suffer serious damage.

An extensive and uncontrollable fire broke out after the earthquake in the Nagata ward of Kobe, which has the highest population density in the city. In this area there are many old wooden houses and apartments as well as numerous small factories manufacturing rubber shoes. Water was not available from fire hydrants as the supply had been suspended, and fire-fighting was consequently extremely difficult. It took more than 30 hours to extinguish the fire, using sea-water. Overall, the fire after the earthquake burned out 7,456 houses in over 530 localities. Streets, bridges and railways were also seriously damaged.

The earthquake struck an aging society.

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.

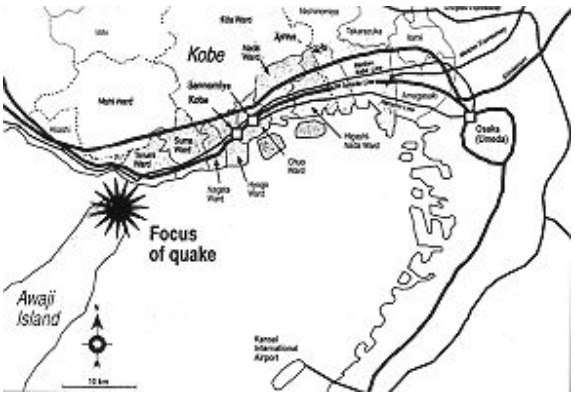


In other words, most of the deaths in this earthquake were caused by the collapse of old Japanese houses. And half of those people were over sixty since the elderly tend to live on the ground floor to avoid climbing stairs.

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}.**

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



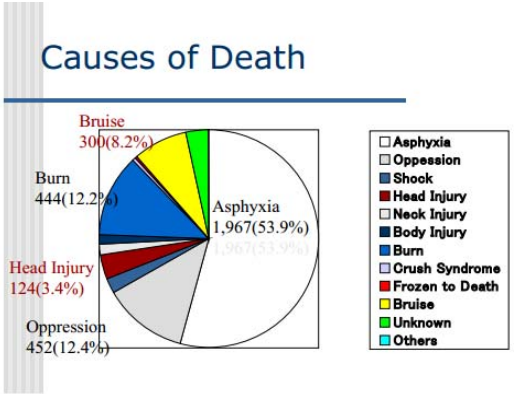
Epicenter of the Quake

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

Approximately 6,434 people lost their lives; about 4,600 of them were from Kobe.

43,792 people injured

3 considered missed



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. We had a large number of injuries just after the quake, but later we also had an increasing number of patients with respiratory and circulatory disorders such as pneumonia, hypertension. or heart disorders in the evacuation Centers due to crowded conditions and lack of sanitation. Furthermore, many people lost their medication and started to become ill several days down the road.

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).

The number of rescued people

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

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.

Neighbors carried out a person crushed under the house

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.

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 6,922 calls on January 17th 3,483 on the 18th and 2,306 on 19th at the information control center in Kobe whereas the daily average number of emergency calls in l994 was 436 and for fires and accidents 150. 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 contributed to enlargement of the fires but could have done much more. 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.**

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.

The general trend in Japan for a long period was the visit of firemen to companies and private houses and giving guidance for fire prevention. The Kobe City fire department has tried to decrease the number of fires by the same manner. Fortunately, the number of fires has gradually decreased but the numbers of fire engines and firemen also have decreased. At the time of catastrophic disaster, however, the simultaneous outburst of fires at many places cannot be handled by such a system.

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:

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

b) **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.**

c) **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.

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.

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.

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

Building damage during the Great Hanshin-Awaji Earthquake 1995

Building damage

On the basis of the preliminary reconnaissance report, Table 2 shows damage statistics as a result of the survey [2] .Damage is defined as follows:

1) Collapse: Failure or overturning of the entire structure or the complete failure of a single story.

2) Severe damage: A large portion of the building frame is damaged. Permanent deformation of the structure may cause imminent collapse.

3) Moderate damage: Significant structural damage is visible. Permanent deformation between stories exists, but there is low probability of collapse.

4) Minor damage: Minor structural damage, although the structure may have significant architectural damage.

5) Slight damage: No structural damage. Architectural damage may be noticeable.

The number of building s in the collapsed and severely damaged categories exceeds 1000. Buildings that suffered at least moderate damage exceeded 1,760.

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**.

Lifeline damages

As is known the Hanshin area is densely urban area located between the Rokko Mountains {highest peak 931m) on the north and the Seto Inland Sea on the south with average width

Damages of Railway Facilities of Kobe City

about 3 km. In this narrow area, there are two national highways (Route 2s and 43}, an elevated highway (the Hanshin Expressway), three railways (the JR-West, Hankyu, and Hanshin). These 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

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

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, The repair processes for the area's lifelines are shown in. Damage to elevated highways was particularly serious, which not only prevented traffic on the highways themselves but also on the streets beneath them. Some newly constructed elevated highways were also inactivated, especially those built on reclaimed artificial land which was floode. 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 250300 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.

Damage and recovery of other lifelines were as follows:

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, except for the

38,000 residences that had completely collapsed. Under these conditions, communications capability was critical. 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. Telephone lines were out of order during the first day in large areas of the region, while others were overloaded. Over 1800 emergency calls made on 118 emergency circuits were recorded on the 119 dispatch logs on January 17, 1995, at roughly 100 calls per hour or 1.7 calls per minute. These, however, were only the calls that could get through. The number of calls attempted, but not completed, cannot be estimated. 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.

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. In Kobe City, fail safe systems for the main pipelines were present but brunch pipelines were severely damaged.

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. Walls of the sedimenting pond in the Higashinada sewage plant were toppled and it temporarily used the nearby sea canal as a processing pond. People rushed to shelters such as schools, health centers, the City Hall or other big buildings because of fear of the aftershock and to escape fire. In some places, more than 3000 people were in very congested dirty areas. Toilet basins in the shelters were transformed into mounds one day after the disaster. 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.

Map of damaged sewage channels (shaded areas)

People made great efforts to provide toilet facilities. Some dug a trough in the ground. Others tried to clean flush toilets with buckets of water but this did not work long because of the broken sewage channels. 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. Eventually many portable toilets were supplied. 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.**

In the shelter, where good systematic management or initiative was established, people tried themselves to clean toilets and collected waste regularly without contaminating the area. They sprayed disinfectant and killed odor. Many items useful for cleaning and disinfection were supplied and a number of volunteers cleaned toilets. This worked in those shelters where the management system functioned smoothly. However, in shelters, where the management was poorer or even non-existent, volunteers were not accepted or had a hard time to find a way to work with the homeless resulting in filthy toilets and contamination of the surroundings.

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. There are several possible reasons why there were not severe diarrhea outbreaks. Firstly, the low temperature in the winter helped to prevent bacterial growth in food. Also food boxes were checked for the homeless for toxigenic or hemorrhagic *E. Coli* or other bacteria and suggested that those who

prepared the food boxes should heat the food adequately. In addition, many people cleaned the toilets and sprayed disinfectant around them. Wet disposable towels were distributed to clean contaminated hands. Waste was collected effectively by the tank lorries with a vacuum pump, without spillage.

For the respiratory diseases, special medic teams monitored the influenza and gave vaccines. In this situation, the factor that most contributed to stopping the influenza epidemics was the fact that most of the people in the shelters were relatively old, over 60, and had already been exposed to the various pathogens in the past and were immune to them.

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.

Problems of emergency care providing shelters and faults in coordination and communications during the disaster response

Providing shelters

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. On January 23 and 24, the maximum number of refugees was recorded, 316,678 ,of which 235,443 were in 601 shelters in Kobe City. In mid-April, more than 40,000 people were living in shelters because construction of temporary housing had not gone smoothly. In most damaged areas, there was little public open space. Space for construction was available only on inconvenient reclaimed land or 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 helper sand volunteers, and at the shelters, such assistance was readily available, The volunteers totaled more than one million, and they came from all over Japan, the firs t such massive volunteer action seen in 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, even urgent problems.

Lack of coordination and communication

The operations logs of the Kobe Fire Department document actions taken during the first critical hours following the earthquake. **The record reveals the gaps in information that seriously affect the coordination within and between jurisdictions. 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**. **These conditions indicate the perverse effects of law, intended to protect citizens, in restricting the capacity of public managers to carry out their mission under dynamic conditions**

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.

Participation of both private and nonprofit organizations peaked in the third week of operations, as reported in the *Japan Times*. Interesting also is 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

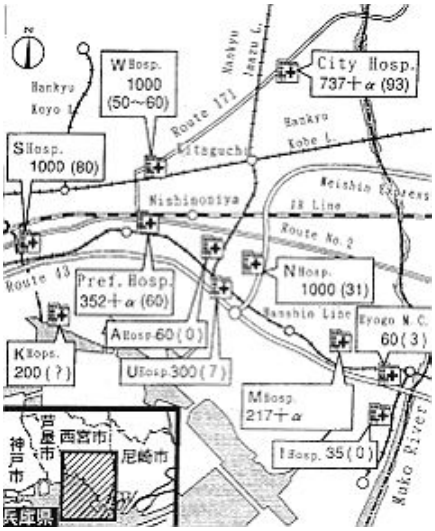
Overwhelming casualties

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.

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.



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

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. As the water level in the tanks dropped, water was automatically pumped up from other water tanks in the basement and eventually all the stored water was lost. 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. Whatever medical instruments had escaped direct damage could not be operated anyway.

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.

Breakdown of telecommunication systems and lack of the information

As said, 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 showed scenes of fires and destroyed highways, but 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 . With the interruption of telecommunication systems and the serious traffic jams, a journey even of only a few kilometers was regarded as an infinite distance by the general public and ambulance crews.

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.

Crush syndrome and other pathologies

The earthquake created enormous psychological stress for the mere than 2. 4 million survivors living in the damaged areas. It was the first instance of extended human ware management in Japan (human ware items related to human activities). Traditionally, Japanese people have shown much patience against such emotional stress known as "gaman zuyoi". In the damaged areas, little looting or disorder was reported even under continuing miserable conditions. Systematic psychological stress care exercised for the earthquake victims was as follows:

1) Information was disseminated about post traumatic stress disorder (PTSD) in various kinds of brochures as well as in the mass media.

2) Outreach counseling was given the earthquake homeless living in shelters. In earthquake disasters school children experience severe mental stress so that counseling for them is very important. Professional counselors and trained volunteers have been working with these survivors, and counseling will continue for more than two years.

With respect to characteristic pathologies of the patients injured or killed in the earthquake they were as follow:

- traumatic asphyxia and direct whole body crush injury, which were the most frequent causes of death
- fracture of the spine and spinal cord injury, which required hospitalization, although the fate of the paralyzed limb was normally already determined, regardless of emergency surgery crush syndrome, which needed careful attention on the part of the physicians in the early phase

According to the extensive survey conducted on the 6,107 patients hospitalized after the earthquake, 372 presented crush syndrome, with a mortality rate about twice that of other trauma patients.'

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.**

Fortunately, social life was not disturbed by any silly rumors or tumults. A promising sign for Japanese society is that a good number of young people joined in the volunteer relief activities after the disaster in many different fields.

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

. **Members of the Yamaguchi gumi, the crime syndicate that has its headquarters in Kobe, won much popular acclaim by distributing food, blankets and water – often before the official rescue teams had arrived on the scene.**

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

Recovery of lifelines and other urban functions was accomplish relatively quickly (electricity, 6 days; telephones, 14 days; gas, 84 days; water , 90 days; sewers, 93 days) but reconstruction of industry and housing took longer.

Immediately after the earthquake, some communities were cut off due to damaged roads. Evacuation of victims was therefore difficult, and delivery of emergency supplies and lifeline services were delayed.

As a part of disaster recovery the repair of roads used to supply daily necessities was therefore prioritized in order to quickly reestablish lifelines.

Almost all elevators stop running during earthquake. In almost every case, earthquake control operation equipment functions and the elevators went to the nearest floor, stopped, and opened their doors. Except for buildings that could not be entered for security reasons, expert technicians confirmed safety in order to prevent secondary accidents, and service is restored the following day. Emergency stop equipment engaged when door abnormalities were detected. Elevators should be equipped on the inside with devices for manually opening doors, similar to the emergency doors on trains, so that people can escape safely. The Great Hanshin-Awaji Earthquake of 17 January, 1995 caught both the residents and local government of Hyogo prefecture flatfooted. *This mostly has been due to the fact that for about 70 years devastating earthquakes did not occur in this region. The Disaster Management System of Hyogo Prefecture mostly focused on prevention and response on sedimental disasters such as flooding, heavy rains, landslides and so on. However Kansai region is located on earthquake prone area there were earthquakes but they were not so devastating and did not affected to the great extent.*

But anyway 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

According to Disaster Countermeasures Basic Act prevention of disasters shall be performed for the purpose of preventing any disaster ahead of time in matters listed below

- keeping in good condition of organizations concerned with disaster prevention
- drills for disaster prevention
- stockpiling, replenishing and inspection of materials and supplies for disaster prevention
- maintenance and inspection of establishments and equipment for disaster prevention

Unfortunately, the Great Hanshin-Awaji Earthquake revealed the bitter truth - designated administrative organs along with designated public organs altogether with designated central administrative organs both on prefectural and municipal failed to display efficiency during each phase of disaster management .So deep structural changes in disaster prevention and disaster recovery system of Hyogo prefecture were urgently and desperately required

Therefore Hyogo Prefectural Government alongside with Cabinet Office made had conducted successful reforms in disaster management system nationwide and on prefecture level that eventually positively reflected during response for The Great East Japan Earthquake 2011 and some others.

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.

At local communities, voluntary disaster response organizations play an integral role in emergency drills including information collection and communication, fire extinguishing, rescue activities, evacuation, meal and water provision, etc.

Holding emergency drills at local communities is recommended in the Hyogo Disaster Management Action 2010-2014, a program advocated by the Hyogo Safety Day Promotion Committee established by the prefecture with the partnership with Hyogo-based groups from all walks of the society. Under the plan, such activities are supported by subsidies and sending

experts.

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

"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)

Partnership with citizen groups

Hyogo Prefecture has established the Hyogo Safety Day Promotion Committee inviting Hyogo-based groups from all strata of society to join in. The Hyogo disaster management special promoter system was set up to dispatch experts in the field of disaster management to local residents' associations and schools. The committee is endeavoring to raise people's awareness towards disaster preparedness.

Case-study: Local Voluntary Disaster Management Organization "Bousai-Fukushi Community"

When a disaster occurs, it is important for local residents to take the initiative in performing urgently required activities such as fighting fire, fighting floods, search and rescue. For this reason, residents aware of the need for solidarity in the community established local voluntary

Local Voluntary Disaster Management Organizations

disaster management organizations named "Bousai-Fukushi Community" in Kobe. These organizations prepare materials and machinery in the region, and practice disaster management drills routinely. The Government of Kobe City supports the activities. As of march 2007, 189 organizations were established at each elementary school area, which covers about 90% of the city area.

Learning from the great Hanshin – Awaji Earthquake, Japan has undertaken new measures and strengthened and improved existing ones in order to mitigate earthquake damage.

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.

Eighteen EARTH members were sent three times between March and April (60 more between July through August) in response to a request from Miyagi Prefecture Board of Education in the aftermath of the Great East Japan Earthquake of March 11, 2011.

The first group worked on support for schools that have been used as shelters in the town of Minamisanriku beginning from March 15, the fifth day after the earthquake occurred. During that period, in cooperation with the Miyagi Prefecture Board of Education, EARTH generated a checklist of necessary tasks to achieve a resumption of school following the earthquake and the checklist was actively used to make this happen.

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

According to the Basic Disaster Management Plan (July 2005, Central Disaster Management Council), “Recovery and reconstruction of affected areas has the aim of supporting victims in putting their lives back in order, working towards recovery of facilities with the focus on the prevention of repeat disasters, and providing the basic conditions for local development from the perspective of improving safety. In addition, the promptest and smoothest possible recovery and reconstruction should be implemented in light of reduced socioeconomic activity in the community because of the disaster.”

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

(1) 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 and establishing the On-site Disaster Management Headquarters as a legal entity have been implemented. 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**

Natural disasters can cause very significant damage to livelihoods. For victims who face difficulties rebuilding their lives and regaining their independence due to economic or other factors, prefectures can use funds contributed from a mutual aid perspective to help the victims

regain their independence. The law was passed and implemented in 1998. In 2004, it was revised to relax the conditions for its application and to increase the maximum payment amount.

Case study: Kobe city Disaster Management Plan

This is a plan made by Kobe City Disaster management Council in which the Mayor of Kobe takes the chair according to local circumstances and the Disaster Countermeasures basic Act. **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

Kobe City Disaster Management Plan

Securing lifelines

Lifelines are directly related not only to recovery and reconstruction, but also to ending evacuee conditions.

Securing personnel to work on recovery and reconstruction is important but for improved earthquake resistance for facilities and quick restoration of function after disaster establishment of earthquake inspection technology and retrofitting methods for existing facilities and research and development of technology for prompt discovery of areas damaged in a disaster are also necessary.

In addition, during recovery and reconstruction checks, wiring and pipes must be decentralized through sectioning off, duplicating, or networking

(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.

(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. An automatic shutoff system linked to earthquake warning bulletins is needed for liquid propane gas as well.

(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

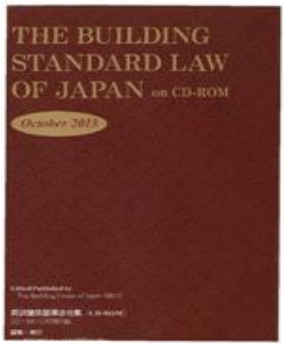
Sewage facilities such as treatment plants, pumping stations, and pipelines constructed since the Great Hanshin -Awaji Earthquake are generally earthquake resistant. For joints, very elastic and watertight expanding and flexible joints are used, and monitoring of sewer damage status through remote-control television cameras is progressing. Sewer services are restored in conjunction with recovery work on waterlines.

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. More than 20,000 designated buildings have been retrofitted

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
- Rationalization of regulations regarding existing 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.

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. Buildings with insufficient earthquake resistance are to receive not just guidance and advice, but also will receive instructions, be required to make reports, and submit to on-site inspection, and buildings that fail to comply will be publicly identified. Revisions to the Earthquake Retrofitting Promotion Act such as new provisions requiring action to be taken with respect to general housing are also under consideration.

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 suppression

There are three types of construction that raise the earthquake - resistance of buildings: “earthquake resistant construction,” “seismic isolation construction,” and “vibration suppression construction”

Earthquake resistant construction utilizes studs, walls, and other structural elements to absorb seismic forces through elasticity or elastoplasticity.

Seismic isolation construction utilizes equipment such as bearings in foundations, between stories, and so on to absorb seismic energy and prevent buildings from shaking.

Vibration suppression construction utilizes suppression equipment such as dampers in wall stone absorb seismic energy and control shaking of the entire building.

Earthquake resistant construction proved effective in the Great Kanto Earthquake. During

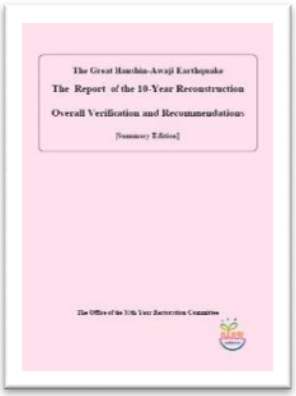
Japan’s period of rapid economic growth, buildings became taller and in the 1980s vibration suppression construction increased mainly as a means of improving livability in high winds. Seismic isolation construction has increased since the Great Hanshin – Awaji Earthquake.

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 to ease the cost burden.

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 (overall verification, health welfare, society and culture, industry and employment, disaster reduction, urban development and community building)

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

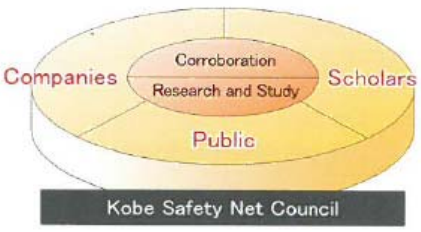
Japan's environmental and geological circumstances make it highly susceptibility to natural disasters. And, as is clear from its history of such disasters, inherent in Japan is the possibility of another large-scale disaster capable of severe damage over a large geographical area. **Disaster Reduction 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

It is essential that the lessons learned from the Great Hanshin-Awaji Earthquake and other past natural disasters are conveyed to the next generation, that these lessons are utilized in disaster countermeasures aimed at lessening the damage inflicted by disasters, and that each individual incorporates these lessons in their concrete activities.

Crises Management Research Committee "Kobe Safety Net Council"

The Kobe earthquake caused damage to local private companies. But many private companies contributed relief goods, assisted fire fighting and rented their buildings as evacuation sites. Some stores began business soon after the disaster.



From the lessons, the private companies, scholars

on disaster management and the government of Kobe City established a crises management research committee named “Kobe Safety net Council” in 2001. As of March 2007, 83 companies have joined the council.

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 sedimental disasters countermeasures

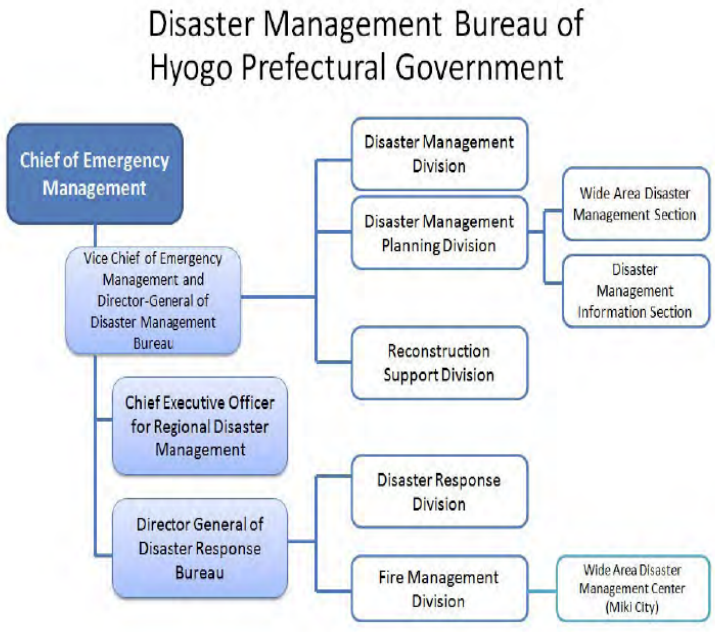
River development projects are undertaken by Hyogo prefecture with the assumption of a heavy rain level that occurs once every one to five decades. The River Improvement Plan Review Committee established in conformity with the River Law conducts adequate analysis on disaster risk management.

In order to counteract floods triggered by an unconventional type of natural disaster in the area such as a guerilla rain or sudden local downpour, 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 and facilities to enable rainfall to readily permeate the ground 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.

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 post was established on 1 April 1996**.** Mr. Akinori Sugimoto, Superintendent for Disaster Management of Hyogo Prefecture is the incumbent at the moment.

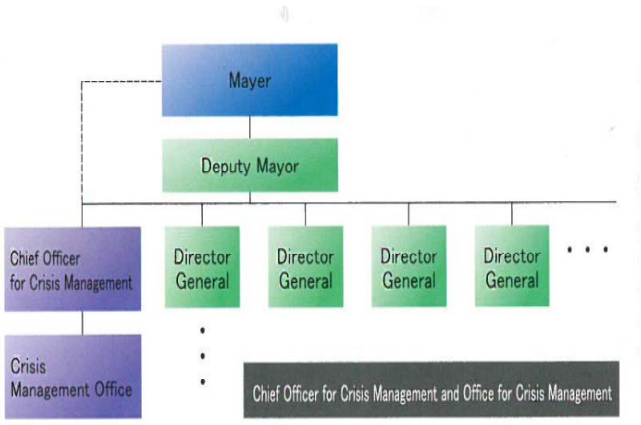
Establishment of the Disaster Management Planning Bureau and the Disaster Response Bureau. The organs were set up on 1 April 2005. The superintendent serves as the chief officer who assists the



Composition of Disaster Management Bureau of Hyogo Prefectural government

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 enhancement, disaster response, as well as restoration and reconstruction after disasters. The roles of both DRR(Disaster Risk Reduction) or non DRR departments across the prefecture and how they can contribute to local communities in the case of natural disasters are clearly stated in the Hyogo Local Disaster Management Plan, and prefectural personnel are well informed of these details, meaning the prefectural government can act as one body of the DRR team. The Phoenix Disaster Management System, a comprehensive disaster prevention information system, can quickly and efficiently respond to various kinds of disasters by using the disaster and meteorological information collected via terminals at municipalities, police and fire departments, and the Self Defense Force base in Hyogo. The system is equipped with functions to estimate damage, demand and supply of relief goods, displaying necessary procedures to follow based on the collected data and sending out this information to terminals across Hyogo. A 24-hour monitoring and quick-response system is maintained in anticipation of the occurrence of a disaster or other emergencies, by means of a duty rotation system as well as a standby system with both designated and regular personnel residing in standby accommodation. To better prepare for future natural disasters by sharing the experiences and lessons Local Progress Report 2013-2014 2/37learned from the Great Hanshin-Awaji Earthquake, the prefecture established the Disaster Reduction and Human Renovation Institution (DRI) in which earthquake related resources are collected, preserved, and exhibited. The DRI also fosters DRR specialists and young experts, promotes pragmatic DRR research, offers on-site assistance in disaster-affected areas, and functions as a hub for exchange and networking with global counterparts.

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.

Improvement of seismic observation network

In the wake of the Great Hanshin – Awaji Earthquake, the legislator- initiated Earthquake Disaster Management Special Measures Act was passed in July 1995 to promote comprehensive measures for earthquake disaster management.

The Headquarters for Earthquake Research Promotion set forth “Basic Earthquakes Survey and Observation Plan” in August 1997.

For earthquake observation, 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.

Placement of terrestrial broadband seismographs (seismographs that record surface vibrations over a wide range of frequencies, from fast vibrations to very slow ones) in 112 locations.

Underground strong - motion seismographs (seismographs that monitor strong vibrations too great to be recorded by high – sensitivity seismographs) are in place at 975 locations, generally at the same sites as high – sensitivity seismographs. There are also 3,564 in surface locations, with an additional 2,800 belonging to local governments.

Placement of GPS continuous observation facilities (a system using satellites to monitor plate and crustal deformation) in 1,456 locations

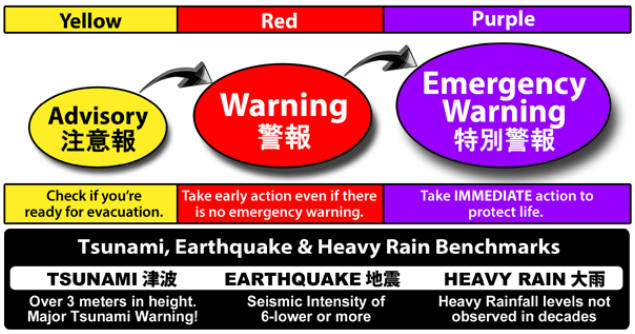
Replacement of the seafloor seismograph off, placement of cable-type seafloor seismographs.

Prompt communication of data obtained through seismic observation.

Currently, data from seismic intensity indicators in every prefecture are connected to the Japan Meteorological Agency, which broadcasts a range of information to the public should a seismic event occur. 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. When large - scale damage is expected, a headquarters is formed in the Prime Minister’s Office and an emergency assembly team is convened.

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. Damage can be reduced by carrying out the following disaster management action before the principal shock arrives:

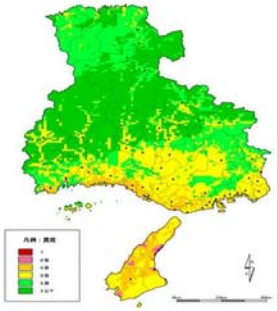


JMA warning and notification system

- Automatic control of trains, elevators, etc.
- Avoidance of dangers by transmission to people in buildings, at local governments, etc.
- Practical application of data transmission systems such as mobile phones and satellite communications
- Damage mitigation by turning off electricity, gas, fuel to factory production lines, and other elements that can cause fires, and backing up important data.

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.



Current seismic intensity distribution map of Hyogo prefecture

Earthquake hazard maps have been prepared for Tokyo and six cities including Yokohama and Nagoya. Tsunami hazard maps have been created for only 122 of Japan's coastal municipalities, about 12 percent of the total of 991. The Central Disaster Management Council raised the issue of the creation of tsunami hazard maps within the next five years for all municipalities that need to introduce tsunami disaster management measures. 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.

Research and development budgets for science and technology related to disaster management and establishment of the Headquarters for earthquake Research Promotion

Japan's disaster management countermeasures, including those for natural disasters, are based on the Disaster Countermeasures Basic Act, which was passed in 1961 in the aftermath of the Typhoon Ise-wan of 1959.

地震調査研究推進本部
The Headquarters for Earthquake Research Promotion

Logo of the Headquarters for Earthquake Research Promotion

In recent years, research and development on technology related to disaster management has proceeded in accordance with the 1993 Basic Plan for Research and Development on Disaster Prevention (December 1993, decided by the Prime Minister).Following the Great Hanshin-Awaji Earthquake, the Headquarters for earthquake Research Promotion was established as a special government organ in July 1995. It carries out earthquake - related observation, measurement, surveys, and research.

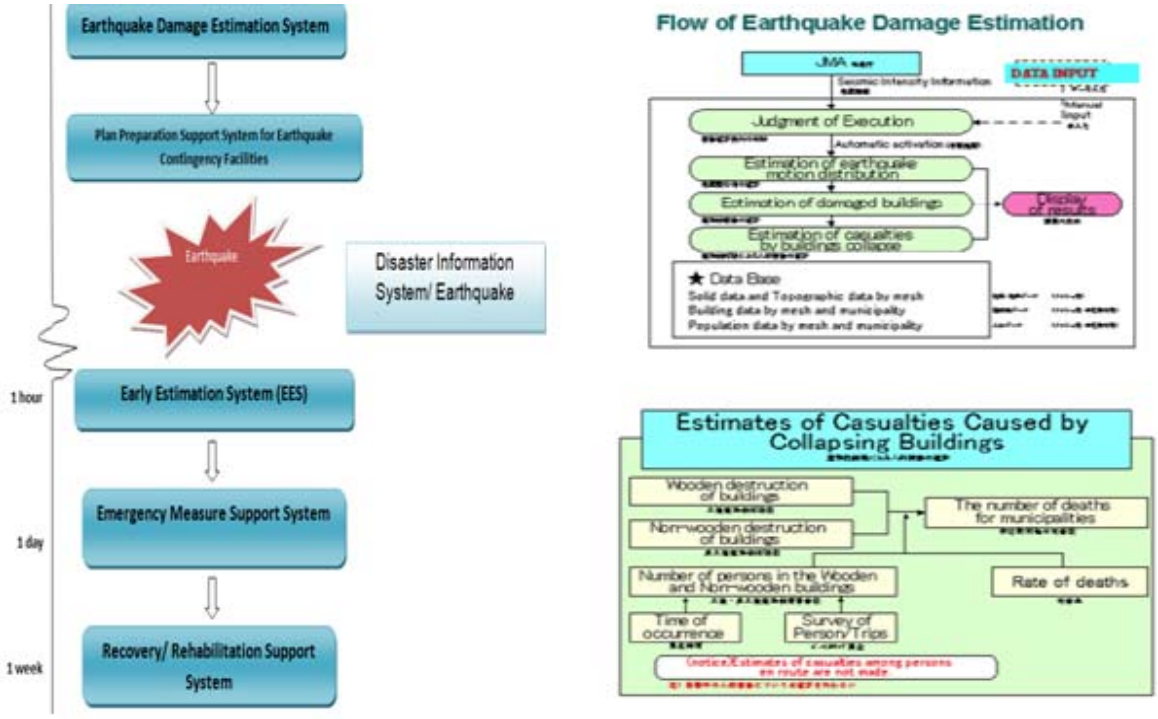
The government developed a disaster information system, which consists of an

Early Estimation System and an Emergency Measures Support System

Disaster Information Systems

The Japan Meteorological Agency (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.

The Figure 1 illustrates the Disaster Information System. After the earthquake, the government first estimates the damage such as number of deaths, injured, collapsed houses and so on.



Disaster Information System and Flow of Earthquake Damage Estimation

Then the government estimates the needs of support in terms of materials, manpower for rescue and rehabilitation, hospital beds, evacuation camps etc.

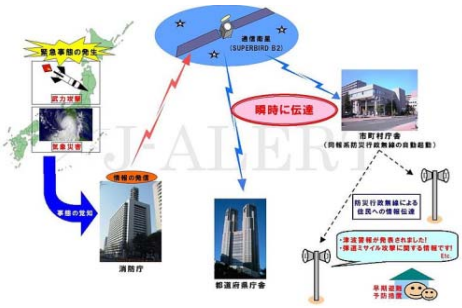
The estimation system is based on population, building structure information, ground conditions, time of occurrence and survey of persons using transport. Normally persons using transport are excluded from the estimation.

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.

The earthquake damage estimation system enables an estimate for damaged building and casualties to be obtained. Based on this damage estimation, the level of need for support is calculated by computer.

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. The system was developed in the hope that early warnings would speed up evacuation times and help coordinate emergency response



J-Alert System

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.

Improvement of sedimental disasters countermeasures

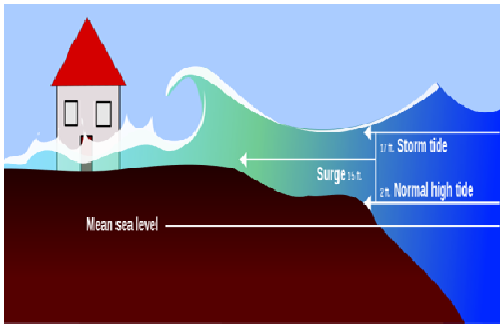
River development projects are undertaken by Hyogo prefecture with the assumption of a heavy rain level that occurs once every one to five decades. The River Improvement Plan Review Committee established in conformity with the River Law conducts adequate analysis on disaster risk management.

In order to counteract floods triggered by an unconventional type of natural disaster in the area such as a guerilla rain or sudden local downpour, 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 and facilities to enable rainfall to readily permeate the ground 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.

Storm Surge Measures incorporating Natural Features

Hyogo prefecture is taking measures against storm surges by developing coastal areas that can withstand the highest sea levels in the past. For the development of coastal areas as well, the Hyogo Prefectural government not only maximized the disaster management function that can counteract storm surge, but also to preserve biodiversity by adopting a construction method, which can bring out the blessings of nature to people.



Storm Surge

Flood control measures by making use of nature

Hyogo prefecture undertakes flood control measures by improving rivers with the assumption of a heavy rain level that occur once every one to five decades. The basic philosophy lies on the foundation of river improvement efforts. These efforts include to making rivers safe and sound, maintaining rivers so that people can feel the abundance of nature, developing rivers that incorporate characteristics of basins and the culture that revolves around water, and fully bringing out the attractions and comfortableness of riversides.

The following steps were designed to fill gaps and improve disaster response system of prefecture in particular and disaster response system of the country

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

Information Control Center

A disaster-related medical information network has been established.

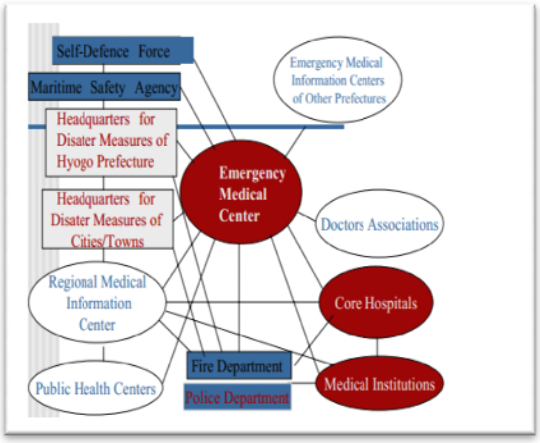
While keeping the existing system for emergency medical treatment, a comprehensive network system will be introduced to each of various regional institutions to collect and disseminate medical information in the situation of disaster.

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.

In addition to the previously established systems, it is planned to use formation of a new multi-centered network with the use of computers and multi-display phones in metropolitan areas. 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



Outline of Interaction of Emergency Medical Center with other disaster management authorities

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.

There are ten regional areas in Hyogo prefecture. We also established strategically located core hospitals 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.

Ten regional areas in Hyogo Prefecure

(Training and disaster exercises of medical professions and medical volunteers) Training and exercises are very important for health/medical professionals to understand and enhance their roles in disaster situation. Triage techniques and specific skills to manage common injuries and diseases associated with disasters should be required to understand and practice. 2-3 doctors are nominated as Disaster Medical Coordinators in each DMC.

Training seminars of personnel are held several times a year

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.

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 facilitate the initial and emergency response at the time of a disaster and 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, coast guard headquarters and lifeline operators, as well as other related agencies, and are strengthening cooperation with relevant organizations. The system becomes actively engaged with systems related to disaster prevention within the prefecture.

During times of non-emergency communication support features, such as e-mail and electronic bulletin boards contribute to flexible information sharing between agencies and organizations involved in disaster prevention.

Phoenix Disaster Management System at the time of an earthquake

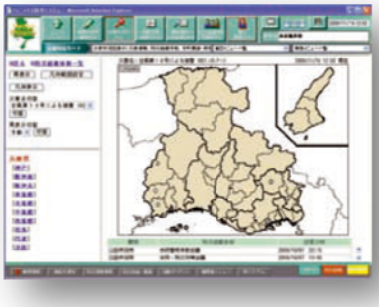
1) **If there is an earthquake with a seismic intensity of three or more (on the Japanese scale) within the prefecture, the system calls for attention by displaying blinking pop-ups, together with a sound**

2) **The System collects earthquake intensity information from the seismic intensity meters set up at 96 locations within the prefecture (Seismic intensity information network)**

3) **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**

4) **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.**

5) 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



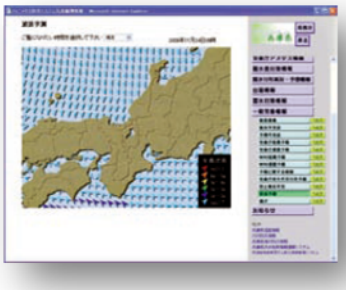
6) Where required, the actual situation of the disaster is ascertained in real time, using on Heli-Tele images and other sources of information.

During times of non-emergency

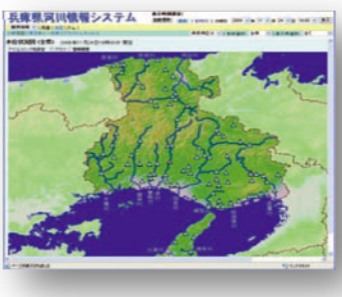
1) The System issues latest alert and update alarm status

2) Issues satellite images

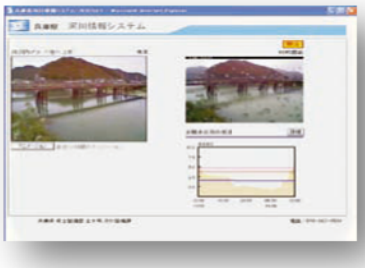
3) Carry outs monitoring and makes wave prediction



4) Issues the Map of water level status



5) **Keeps a record of water level graph and broadcasts river camera images**



6) **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.**

7) **The system delivers disaster prevention and meteorological information as well as disaster-related information to prefectural residents.**

Phoenix Disaster Management System discharges belowmentioned functions:

- Observation and information collection

The system collects and stores meteorological information from the Japan Meteorological Agency and operators transmitting meteorological information, as well as information on rivers and on landslide warnings, and providing the results of the processing of this information to the disaster prevention terminals.

- Earthquake intensity information collection

The system collects information from the seismic intensity meters set up within the prefecture.

- Damage prediction

Based on information from the seismic intensity meters set up within the prefecture and basic data on buildings, population and other factors based on a grid of 500 m x 500 m cells, the system produces a earthquake intensity distribution map, makes damage predictions including the number of destroyed buildings, and the number of causalities and fatalities, and displays this information on the disaster prevention terminals.

- Supply and Demand estimation

Using the disaster prevention terminals, the system analyzes how many plans need support such as disaster prevention materials and personnel necessary for disaster prevention, based on the damage predictions and other results.

- Disaster information reporting

The system reports the damage situation from various aspects, such as office damage reports from disaster prevention-related organizations, disaster flash reports and summary disaster reports, together with maps and digital camera photographs, and displays them on the disaster prevention terminals.

● Image information system

The system displays the disaster information images from Heli-Tele, high-altitude cameras, river cameras and elsewhere and the content displayed at disaster prevention terminals is displayed on the big screen in the Emergency Relief Headquarters Control Room, so supporting various meetings, etc.

● Crisis management notification

The system sends notifications of information such as alerts, alarms; seismic intensity information and disaster flash reports, by displaying them on the pop-up navigator of each disaster prevention terminal, giving warnings to all organizations related to disaster prevention at once.

● Geographic Information System (GIS)

The system manages prefectural maps (1/250-1/1,500,000), and displays a variety of information, including that related to disaster-affected areas.

● Communication

Utilizing the Internet, the system provides a website for prefectural residents with disaster and meteorological information (a PC version and a mobile version are available).

Also, at “Hyogo Disaster Net,” the system transmits emergency information (including earthquake information and meteorological alerts and alarms) extremely rapidly by using mobile phone e-mail.

● Securing power supply

Uninterruptible power systems (UPS) and emergency generators have been set up for the system, in order to prevent it being affected by power failures.

● VPN (Virtual Private Network) for disaster prevention that covers the whole area of the prefecture

The system connects the prefectural government office, the regional prefectural organizations and organizations related to disaster prevention within the prefecture using dedicated optical fiber lines such as the Hyogo information highway and the prefectural government office WAN; however, to ensure security a disaster prevention VPN has been built for the system.

● Securing of backup lines

The system employs a structure that makes it possible to establish a connection by taking another route in cases where damage has been caused to the main line to the prefectural government office (where the server is located). At the same time, the system makes it possible to use ISDN lines as a backup line, should all of the glass fiber dedicated lines become unusable.

● Structures with earthquake-resistant floors

The system employs structures with earthquake-resistant floors for the network control room, where all the servers and other equipment have been set up, and for other facilities.

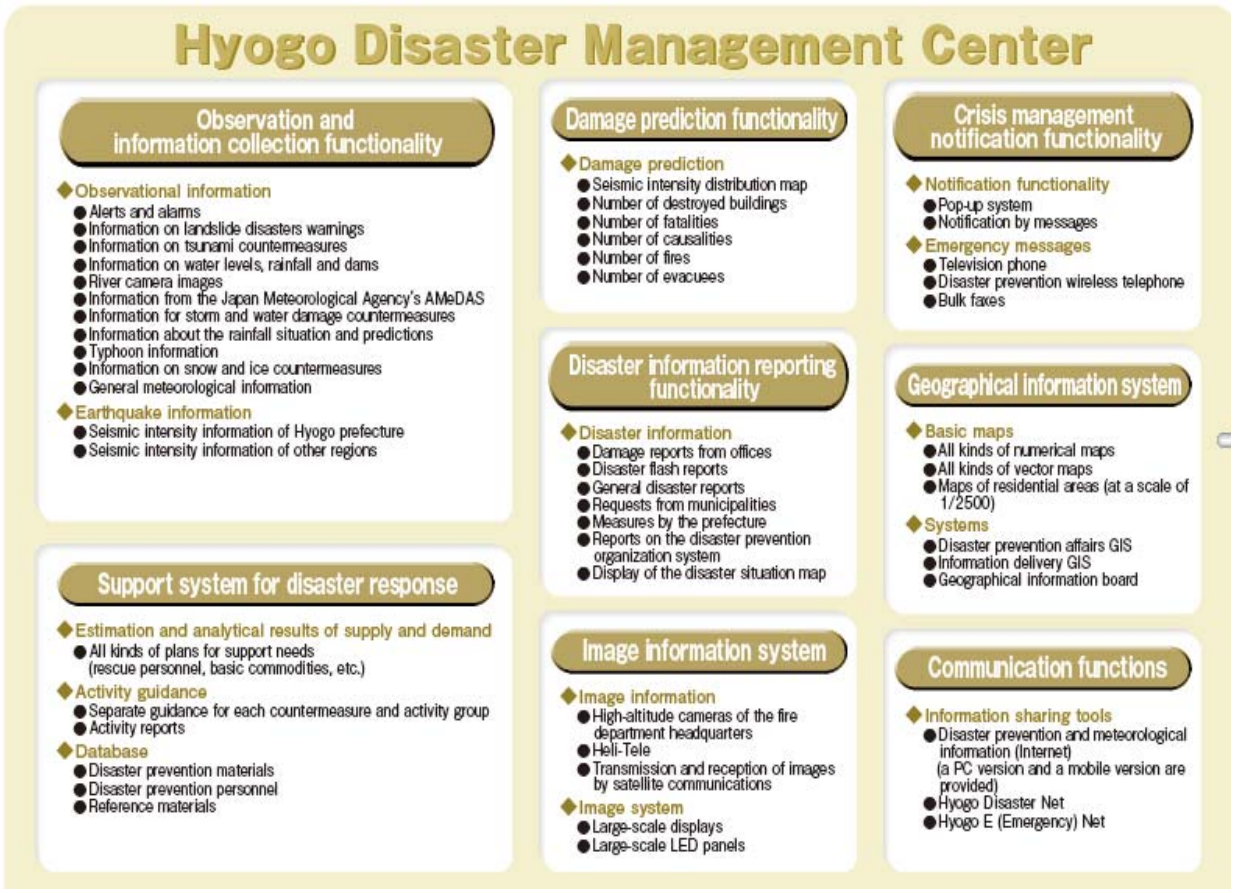
● Establishment of a backup center

The system has established a structure that makes it possible to use a backup center in the Hyogo Prefectural Emergency Management and Training Center in Miki which lies 16 kilometers to the Northwest of the prefectural government office, for cases where the Hyogo Disaster Management Center becomes unusable due to a large-scale disaster.

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.**



Functionality of Phoenix Disaster Management Center

Functionality of Phoenix Disaster Management System

If the scale of disaster increases, many problems occur, such as:

- Increasing of the delays occurring in the transmission of disaster-related information
- Uncertainty in assessment of personnel and the amount of materials needed for support measures and conducting relief operations
- In case communications fail it becomes impossible or at least extremely complicated to establish contact with related organizations
- As ensuing from above mentioned quick disaster response for inexperienced staff becomes impossible

  Therefore, confusion arises with regard to decision-making related to matters such as the securing of personnel for each kind of countermeasures that the prefectural Emergency Relief Headquarters have to implement.

In order to overcome these problems and in order to implement a swift and accurate response, it is necessary to produce a quick approximation of the overall damage caused, regardless whether there have been requests for support from municipalities, and to carry out decision making related to disaster countermeasures to be taken by the prefecture, as well as implementing concrete measures.

Therefore, in order to support decisions as to how to respond that the staff members involved in disaster response have to make, the system has functionality enabling it to estimate and analyze matter such as the number of necessary personnel and the amount of materials necessary for support measures based on the results of damage prediction, as well as to give guidance on initial responses based on the damage information acquired.

Supply and demand estimation and analysis function

In addition to estimating the required number of personnel and amount of materials in each affected area using the damage prediction system at the time of the earthquake disaster, the system also conducts an analysis of supply and demand for resources such as personnel, equipment, and relief supplies

Guidance function

Concerning the initial response by the Prefectural Emergency Relief Headquarters, the system displays the flow and procedures for each prevention measure item and also record processing status, together with the progressive management of the initial response.

Database function

A database necessary to support the guidance function, supply and demand estimation and analysis function, containing information including that related to disaster equipment, is built.

Through Hyogo information Highway and Internet Hyogo Disaster management Center inform, notify and if necessary warn the National government, Prefectural government and prefectural local administrative agencies, Municipalities, Fire departments, Police, disaster prevention–related agencies lifeline operators and Hyogo prefecture residents and other.

The method of notifying and information of appropriate authorities through Hyogo Information Highway and Phoenix Disaster Management System

The network of the Phoenix Disaster Management System

The network of the Phoenix Disaster Management System consists of:

- **Hyogo Information Highway** (This is a large-scale network of a total length of approximately 1,100 km that has been established as fundamental information infrastructure to promote information technology within the prefecture, and connects key locations within the prefecture with optical fiber lines. High reliability has been achieved for the system through the use of a high-speed and high capacity (10 Gbps), a monitoring and maintenance regime running 365 days a year and 24 hours a day, as well as by making the Hyogo information highway into a loop network and putting the lines underground. Also, access points to the network can be connected to by a variety of access lines.
- **Disaster Prevention VPN** (This system connects key locations such as the prefecture general building and the regional agencies of the prefectural government with a dedicated digital line in a loop, utilizing the Hyogo Information Highway and the

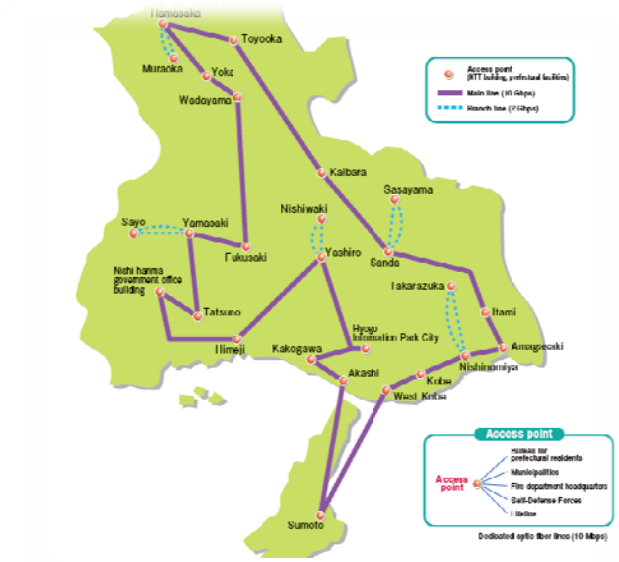
prefectural government WAN as its main transmission channels. From each access point, the municipalities, fire department headquarters and other organizations are connected by dedicated optic fiber lines, thus covering the entire prefecture. Also, in order to ensure security, transmissions use a dedicated disaster prevention VPN (Virtual Private Network) has been created within the network.)

- **Hyogo prefectural administrative radio for damage prevention (satellite and ground based**) (This system connects the prefectural government office with all municipalities, fire department headquarters, etc. using a satellite communication line. Also, the prefectural government office is connected with the bureau for prefectural residents and civil engineering offices, etc. by a terrestrial radio line. This system is not only utilized in times of non-emergency for uses including the disaster prevention wireless phone, for the sending of bulk faxes function and image transmission, but is also used for the reception and transmission of Heli-Tele images and other information at times of disaster.

Hyogo Information Highway

In order to advance the orientation of information technology in Hyogo Prefecture in terms of infrastructure for information and communication, the administration and civil sector in the respective field are promoting comprehensive application for the purpose of supplying the diver services in administration, education, research and medical treatment, and also improving information gaps.

The large scale of fiber –optic network with the total extension of 1,100 km connection through the main bases in the prefecture is the top class in the country. The installation of 26 access points at the main bases, and at the same time, the network infrastructure with high speed and large capacity of 10 G bps with which even animation can be communicated, will be realized.



Network Construction of Hyogo Information Highway

On the other hand, a part of the network will be opened to the private sector for the promotion of diffusion of high-speed Internet service, the improvement of

information gaps among local areas, and for the promotion of industrial development.

And the use of the circuits of Information High-Way is open with free of charge to Cities, Towns, Enterprises, and Organizations and so on. This fact helps the improvement of administrative services, the removal of inequality of transmission of information by regions, and the promotion of industries at various place

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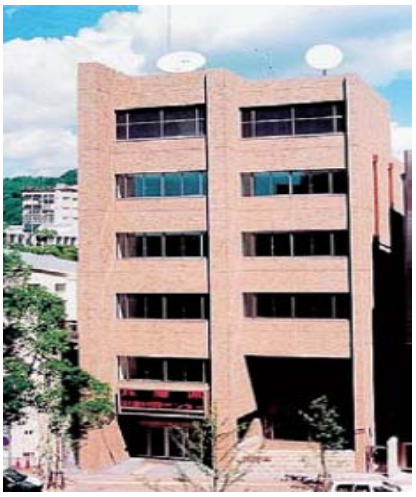
Establishment of "Hyogo Disaster Management Center"

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. The Center also cooperates with the Hyogo Prefectural Emergency Management and Training Center.



Disaster Management Center

It locates in the building that can withstand a 7 level earthquake on the Japanese scale. It has 1 floor below ground, 6 floors above ground. The Center fully equipped with facilities for disaster management. It is capable to operate the emergency Relief Headquarters system smoothly and efficiently, this center secures exclusive work space for related organizations including the Self-Defense Force, the police, fire-fighting authorities, and lifeline companies and media

- All facilities necessary for the 24-hour watching and prompt response system such as night duty rooms are provided Near the Center, standby staff is provided with 76 accommodation units consisting of three buildings for initial mobilization just after the occurrence of a disaster. To call up standby staff, promptly each unit connected with the center through broadcasting equipment.
- Ready for responding to any type of natural disaster
- The structure of the center is not only endurable to storm and flood but also resistant to the same earthquake as the Great Hanshin-Awaji Earthquake measuring 7 on the Japanese Scale. Some of Hyogo Prefectural building code requires one and a half times strength, comparing to normal building code
- Equipped with multiple functions when lifelines are damaged
- Backups are fully provided, such as power generators for emergencies, a stock of fuel, double telephone lines, and the exclusive well to secure drinking water.
- Disaster information system has been improved, including setting up multiple communication channels and new installation of audio visual equipment.
- Food and blankets for immediate use for three days are stored so that Emergency Relief Headquarters staff can devote all their attention to emergency response without external supply.

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, which provides the latest information on disaster damage. This room is situated on the underground level, comparatively resistant in order to make good use of the topography of Kobe which has mountains in north.

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

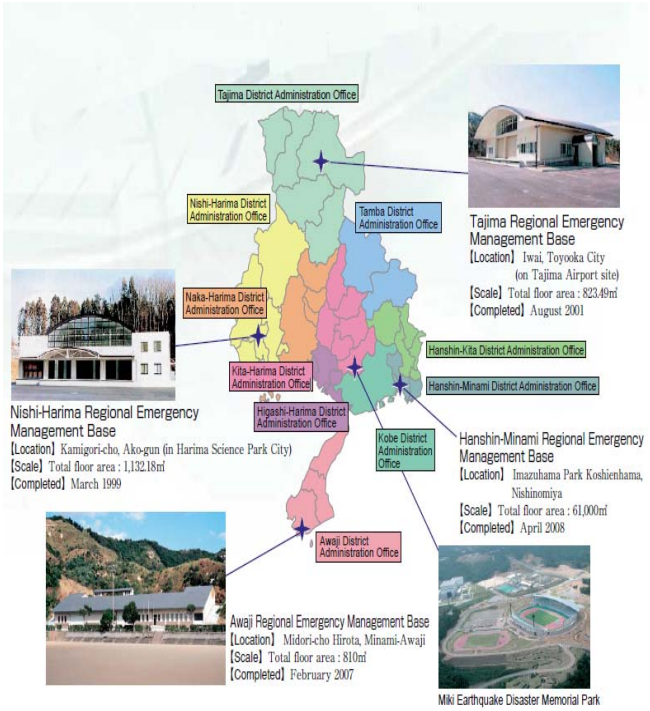
Network control room

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. Miki Emergency Management Base is equipped with the overall function of being a core facility of these regional emergency management bases, and covers the entire prefecture



Hyogo Regional Emergency Management Bases

Function of Regional Emergency Management Bases

1. Storage

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

2. 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.

3. 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.

【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 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.

It should be noted that besides Emergency Management Bases established throughout the whole country almost each city or town located in disaster prone areas local Governments prepare stocks in case of disaster with capacity of various amount of local residents Stocks prepared for disaster. It would be to the point to mention stock for disaster prepared by The Government of Kobe City for 100 000 people. During Kobe Earthquake nearly 60 % of evacuation sites were junior high schools and elementary schools. From the lessons of the Great Hanshin –Awaji earthquake half the stock at junior high schools and elementary schools were prepared.

Stock prepared in school

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

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 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

Miki Emergency Management Base

Establishment and execution of reconstruction plans

With the aim of accomplishing creative 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. Initiatives for reconstruction that belonged to the three categories to support the life quality restoration of disaster victims, that is, housing, infrastructure and industry, were especially focused on under the Priority Three-Year Plans with the goal of achieving the pre-quake level.

Reflecting on the disaster victims' opinions

Although the reconstruction of the affected areas was going on through the Reconstruction Plan and other measures, not a few disaster victims had worries, being unable to find hope for their future reconstruction of livelihoods, even of the next day. Under this recognition, the Hyogo Forum for Advocating Individual Recovery (FAIR) started six months after the Earthquake in order to conduct objective and integrated examination of challenges to overcome in order to restore the means of livelihood of the disaster victims, and to deliver proposals toward that purpose.

To grasp the victims' status and challenges necessary for the reconstruction of their livelihoods, members of the Forum often visited affected areas and exchanged opinions with disaster victims and their supporters.

Urban redevelopment support project

In affected areas, formation of local community groups was encouraged to achieve urban redevelopment with the commitment of the local residents themselves. Such groups played a primary role in urban redevelopment. Hyogo Prefecture promoted the Urban Redevelopment Support Project to dispatch advisors and consultants to such groups and to support urban redevelopment activities of them.

Earthquake insurance

Because the potential damage from earthquakes is so large, it is difficult for private – sector insurance companies to bear the risk alone. Following the 1964 Niigata Earthquake, therefore, the Act for Earthquake Insurance was passed in 1966 to establish an insurance system jointly operated by the government and private-sector insurance companies.

When insurance claims for a single earthquake reach a certain level, the government pays a portion of such claims. Since April 2005, the limit per earthquake has been ¥5 trillion (a possibility in an earthquake on the scale of the Great Kanto Earthquake).

Earthquake insurance is incidental to fire insurance, and is limited to ¥50 million for the structure and ¥10 million for household goods, 30 -50 percent of fire insurance coverage.

Premiums are decided according to date of construction, wood or non-wood construction, and risk by prefecture (four categories).

As of the end of FY 2003, earthquake insurance was attached to about 35 percent of fire insurance policies. About 17 percent of households have earthquake insurance. Including Japan Agriculture Cooperative insurance the enrollment rate is still only about 30 percent. Promoting the spread of earthquake insurance is a current issue.

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.

As one of the most prominent characteristic features of the system decentralization enables more government agencies to be involved in disaster management, although to various extent and bearing various responsibilities, fosters development disaster coping capability of each body or region individually and enhancement overall disaster management system.

Talking about emergency management system in the prefecture in particular, and in Japan generally it is important to distinguish major, additional, specialized and voluntary response bodies and forces. By major bodies we assume municipalities and Japan Coast Guard the former holding the primary responsibility of ensuring and carrying out quick response operations on the land area, the latter within the territorial waters of Japan. Specialized bodies are trained emergency medical assistance teams – DMAT and JMAT and specialized teams of several public corporations designated for disaster management under the DCBA. In turn, additional assistance forces are managed by national level government organizations such as FDMA, MLIT, and MHLW which take disaster response actions once the scale of the disaster is out of response capabilities of a municipal government. At the same time, MLITT, FDMA, MHLW are central bodies for national level supervision and coordination of emergency response activities as well as response assistance during large-scale disasters.

JMA is the key body in prediction major natural hazards such as earthquakes, tsunamis, typhoons and volcano eruptions while MLIT is for flood and sediment disasters and cooperation with them is essential for municipalities and other disaster response organizations. It must be noted that application of latest technologies for disaster warning and communication by JMA had greatly improved disaster response system in Japan. In addition, state lifeline agencies, railway companies, NHK has established quick information sharing with JMA and other relevant bodies as well as response mechanism within respective fields of activity. Although playing important role during large-scale disaster National Police and Self-Defense Forces are additional response forces as join the response activities only upon request.

Explored the disaster management system of Hyogo prefecture and its attributes it is necessary firstly to highlight it’s a) organizational and methodological peculiarities of the system and b) its

technically – structural features that distinguishes this system from the one in my country. Having conducted benchmarking assessment of the both systems I would like to fetch out 2 main peculiarities that principally distinct the disaster management system of Hyogo prefecture from the one in my country.

1) **Decentralized system of disaster management**. Decentralization can be stipulated by the size of the country and in terms of save of the time in disaster management system of the prefecture it plays vital role. Decentralization also empowers local authorities and non-governmental organizations at the same time impose the local authorities as well as local communities with to bear high responsibility for the steps they take.
2) **Overwhelming engagement of local residents in disaster management system**. In Azerbaijan Republic however the population is involved in disaster management system but it doesn't not widespread. It could be partly steam with the fact that unlike local population of Hyogo prefecture the area of which is considered the most disaster prone out of Japan the population of Azerbaijan Republic did not faced devastating disasters in recent years and thus doesn't feel safe. In this case the good practice of BOKOMI – Kobe Community –based Disaster Prevention Organization and other voluntarily disaster prevention organizations would be extremely beneficial. Through The Ministry of Emergency Situations along with other administrative organs systematically conduct disaster management drills unfortunately the local residents are engaged in these drills in a small extent.

Among technical and structural peculiriaties that would be advantageous to adopt is establishment and implementation of disaster prevention information system **Phoenix Disaster Management System** alike that can quickly response any kind of disaster. This is a complete system built by employing internet technology (web technologies) across the board has functions including the collection and provision of disaster and meteorological information, damage prediction, and the estimation of supply and demand. The system provides damage predictions, disaster flash reports, a display of disaster situation map, and more, in addition to providing meteorological information. For the residents, it provides information related to disaster prevention on a web site.

In order to facilitate the initial and emergency response at the time of a disaster and 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, coast guard headquarters and lifeline operators, as well as other related agencies, and are strengthening cooperation with relevant organizations.

Among others I would like to emphasis establishment of disaster-related medical **Information Control Center.** The Center is designed in the case of disaster to collect and

disseminate medical information to each of various regional institutions through a comprehensive network system as well as to distribute medical information and to issue Instructions to medical institutions and ambulance services**.** This can also be used as an emergency medical network during normal period.

In normal situations the Center can be used for exchanging information, in the situation of a disaster , it will support prompt and exact emergency delivery. 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. The establishment and utilization of such kind of disaster–related medical information would be also very beneficial for national disaster management system.

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.

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