RECOMMENDATIONS OF THE TSUNAMI PROTECTION COMMITTEE

MARCH, 2005

TSUNAMI PROTECTION COMMITTEE

CONTENTS

INTRODUCTION

Japan has undergone many great tsunami disasters, and the scars left by tsunamis can be found everywhere in the land and culture of the country like fingerprints and genes. The measures that Japan has been taking to mitigate tsunami-induced damage are recognized as being advanced in the international community.

There were many people, however, who were not fully aware of the horror of tsunami because a great tsunami is a once-in-several generations occurrence.

Vivid photographs and video footages of the recent Indian Ocean tsunami have taught us how dreadful and disastrous a tsunami could be. A number of important pieces of knowledge have been gained and some important lessons have also been learned.

In view of lessons learned from the tsunami disaster, therefore, we have re-examined a wide range of tsunami disaster mitigation measures that Japan has been taking.

In order to ensure safety from tsunami, it is necessary to take comprehensive measures over a large area, knowing how disastrous a tsunami can be and identifying vulnerable places and safety measures that can be taken. It is also important to regard tsunami protection efforts as a continuous process beginning with prevention efforts and ending with restoration and rehabilitation and use a strategic combination of structural measures and nonstructural measures.

The basic policy for the coming years, therefore, is to try to implement an effective combination of structural measures and nonstructural measures before and after tsunami, instead of relying solely on structural measures to prevent disasters, in order to minimize tsunami-induced damage.

In accordance with this policy, "minimizing human suffering" has been set as an urgent goal and "minimizing damage and human suffering" as a medium to long range goal, and targets and concrete measures to achieve them are described in this report.

The central government should be responsible for taking tsunami protection measures, but damage and suffering cannot be minimized by the administrative authorities alone. Awareness and actions of the public and people in all circles and at all levels are essential. It is our sincere hope that the recommendations described in this report will help to start various forms of cooperative efforts of the public and private sectors.

1. TSUNAMI PROTECTION MEASURES IN JAPAN: CURRENT STATE AND PROBLEMS

Sitting practically on top of four tectonic plates, Japan is prone to large-scale ocean-trench earthquakes. In fact, Japan has suffered major tsunami damage roughly once every 10 years.

Furthermore, only about 10 percent of the land of Japan can be used as residential land, and population and industry are inevitably concentrated in alluvial plains and coastal areas. Even in those dangerous areas, intensive and efficient use is made of available space including underground space and highly urbanized cities have been constructed.

The imminence of ocean-trench earthquakes such as the Tokai, Tonankai and Nankai earthquakes* has been pointed out for some time, and the occurrence of nearshore tsunamis caused by those earthquakes has been predicted. There is also concern about a major tsunami caused by a Cascadia earthquake†† expected in the North Pacific Coast or a Chilean earthquake. A nearshore tsunami reaches a shore soon after an earthquake occurs and inflicts secondary damage on earthquake-damaged areas.

Under these circumstances, the current state and problems of pre- and post-tsunami safety measures are as follows.

(1) Current state and problems of warning and information provision

(a) Today, it is possible to issue a tsunami warning within three to five minutes after the occurrence of an earthquake. In the event of some earthquakes such as the Tokai, Tonankai and Nankai earthquakes, however, the first wave is likely to arrive within several minutes after the occurrence of the earthquake.

(b) Tsunami height is highly dependent on such factors as coastal and submarine topography. The percentage of people who can evacuate in the event of a tsunami is low, and effort to provide information to help the public to understand the true nature of tsunami is insufficient.

(c) Facilities for communicating information to visitors such as tourists are inadequate.

(d) Existing systems for providing tsunami information to moving vehicles and running trains, watercraft, etc., in a timely manner are inadequate.

(e) Tide and wave height observation is not timely enough, and offshore observation is inadequate. Reference levels used by different organizations for tide observation are not consistent, and there is no established system for providing easy-to-understand information to local public bodies, local residents, etc.

(f) There is no established standard for conveying information for people who need help in a time of disaster.

1) * It has been pointed out that besides the Tokai, Tonankai and Nankai earthquakes, ocean-trench earthquakes along the Nippon Trench and the Chishima Trench are also likely to occur.

2) † A Cascadia earthquake is a magnitude 8–9 earthquake that has occurred in the region along the Northwest Pacific Coast mainly along the Canada–US boarder at recurrence intervals of 300–350 years. The last Cascadia earthquake occurred in 1700. It has been said for some time that another Cascadia earthquake is imminent.

(2) Current state and problems of preventive measures

(a) Inspection and performance evaluation of facilities that have a tsunami protection function are inadequate. The target levels of the tsunami protection function are inadequate.

(b) The seismic performance and gap-closing performance of 59 percent and 55 percent, respectively, of the seawalls in important coastal zones[‡] have not been checked.

(c) Even in important coastal zones, somewhere between 10 and 20 percent of all municipalities have published their tsunami hazard maps.

(d) There should be more shelters and evacuation routes designed taking topography and evacuation time into consideration.

(e) In areas where it is difficult to provide sufficient shelters because of relatively flat topography, adequate consideration has not been given to the designation of buildings that are to be used as tsunami shelters and requirements for such shelter buildings.

(f) Roads, railways and airports located near coastlines have not been inspected adequately with respect to safety against the expected tsunami height.

(g) There are many facilities for storing hazardous and noxious substances (HNS) such as LNG located in coastal areas. Many of these facilities are not protected from tsunami.

(h) Marine vessels sunk, stranded, broken or swept away and cargoes or other objects washed away could impair port and harbor functions, cause water pollution, and aggravate damage in the hinterland areas.

(3) Current state and problems of post-tsunami measures

(a) It has been pointed out that the systems for collecting tsunami damage information from municipalities to prefectural governments and the Ministry of Land, Infrastructure and Transport are not functioning well.

(b) There is no system for timely collection of such information as whether or not port and harbor facilities are usable.

(c) Damage to emergency transportation roads or important ports and harbors could impair the function of regional transportation networks.

(d) Helicopters and other means of transportation for collecting information and performing rescue and relief operations and disaster prevention bases necessary for relief and emergency restoration operations are inadequate.

(e) The ability to pick up many people drifting in the sea is limited.

(f) Disposal of large volumes of debris containing saltwater in tsunami-affected areas is a problem that needs to be addressed.

(g) Since there are as yet no plans for creating highly disaster-resistant communities, appropriate and timely rehabilitation is difficult to achieve.

3) ‡ Important coastal zones are coastal areas that are likely to be affected by the Tokai, Tonankai and Nankai earthquakes and ocean-trench earthquakes occurring along the Nippon Trench or the Chishima Trench (as of August, 2004, a total of 402 municipalities are located in important coastal zones).

(4) Current state and problems of accumulation and dissemination of tsunami protection technology and knowledge

(a) Even in important coastal zones, about 20 percent of the municipalities do not conduct tsunami response drills.

(b) There is no institutional system under which the causes of major disasters are determined promptly and the findings are reflected in government actions.

(c) Neither administrators, researchers nor citizens can easily obtain information regarding tsunami disaster prevention.

2. BASIC POLICY FOR TSUNAMI PROTECTION MEASURES IN THE COMING YEARS

Tsunami protection measures in the past relied mainly on structural measures such as seawalls designed to guard against a tsunami of an expected magnitude, and there was even no policy for dealing with a tsunami of a greater magnitude.

In view of the current state and problems, the basic proposition in the coming years is to enhance the level of safety as soon as possible despite the limitations in the amount of investment and the response time requirements and strategically promote activities for minimizing damage even in the event of a beyond-design-basis tsunami.

The magnitude of damage is determined by the level of tsunami risk reduction achieved by means of structural measures such as seawalls and the level of effectiveness of nonstructural functions such as the safety level of the social organization of the local community and the inherent fire resistance and disaster tolerance of land use patterns.

In order to minimize damage in an area, therefore, it is necessary to take appropriate and reliable structural measures so that the risk level can be lowered and to take nonstructural measures so that the safety level, disaster resistance and disaster tolerance of the area can be enhanced.

In short, it is necessary to strategically and strongly implement an integrated combination of structural and nonstructural measures as comprehensive disaster mitigation measures.

Since, however, those measures are interrelated, their implementation requires close coordination among the people concerned in view of the realities in the area. At the same time, effort should be made to implement conventional, more or less standardized structural measures in a manner suitable for the area.

On the basis of this concept, comprehensive measures ranging from pre-tsunami to post-tsunami measures that can be taken against tsunami through the allocation of the roles of "self-help," "mutual assistance" and "public assistance" and through cooperation must be taken.

Public awareness of the importance of tsunami preparedness is apt to fade because tsunami is characterized by long recurrence intervals. "Self-help," "mutual assistance" and "public assistance" are based on public awareness. Continued effort must be made, therefore, in the areas of safety education, public relations and tsunami response drills.

3. SPECIFIC URGENT GOALS AND DAMAGE MITIGATION MEASURES

The first step in damage mitigation is to take urgently needed measures to "minimize human suffering."

To this end, educational effort should be made make the residents of coastal areas and tourists and other visitors in coastal areas aware that it is their duty in the spirit of "self-help" and "mutual assistance" to escape to higher areas in the event of an earthquake.

As a provider of assistance to the "self-help" and "mutual assistance" efforts, the government should implement comprehensive measures to disseminate basic knowledge about tsunami, provide tsunami information in an appropriate manner and in a timely manner, and improve the evacuation environment for rescue and relief operations by making evacuation routes and shelters available and providing tsunami protection facilities for tsunami risk reduction.

In so doing, it is necessary to keep in mind that the level of understanding on the part of the public at the receiving end of information and the level of functionality of facilities with a tsunami protection function are deciding factors.

Therefore, with the aim of "minimizing human suffering" due to tsumanis induced by ocean-trench earthquakes whose probability of occurrence is thought to be high such as the Tokai, Tonankai and Nankai earthquakes, specific urgent measures that should be taken within five years from now have been identified.

(1) Warning and information provision

1) Better tsunami warnings

- To improve the earthquake observation network using nowcasting seismographs and achieve faster tsunami forecasting by use of the emergency earthquake information technology
- To construct a system for directly conveying tsunami forecasts and other information to municipal governments
- To disseminate knowledge about tsunami height, methods for expressing the destructive power of tsunami, etc.

2) Conveying and providing tsunami information in an appropriate manner

- To provide easy-to-understand tsunami information such as inundation depth, tsunami arrival time, flow velocity and destructive power in the form of tsunami-prone area maps
- To construct a system for providing information on areas that are likely to be flooded immediately in the event of tsunami for a model area
- To provide information to visitors such as tourists, road users and moving trains, ships, etc. through a variety of means of communication such as telecommunications devices such as cellular phones and other communications facilities
- To establish a method for conveying tsunami-related information to facilities used by people in need of assistance in the event of a disaster
- To exchange opinions with the media on a regular basis about what disaster information should be like and deliberate on methods for conveying information, the content of the information to be provided, etc.

3) Better tsunami observation

- To collect more real-time tsunami observation data obtained at a greater number of locations including offshore locations and to share with the organizations concerned and publish the data thus collected

(2) Preventive measures

1) Improvement of evacuation measures

- To prepare and publish tsunami-prone area maps so that all municipalities in the important coastal zones can compile their tsunami hazard maps
- To ensure the availability of shelters and evacuation routes that are friendly to people in need of assistance in the event of a disaster and assist in eliminating difficult-to-evacuate areas in important coastal zones
- To compile information on buildings to be evacuated in the event of a tsunami, such as requirements and improvement methods, and promote the dissemination of such information
- To disseminate tsunami risk information on a continual basis by use of standardized graphic symbols
- To strengthen evacuation measures so as to facilitate the evacuation of coast and port users
- To create an environment in which moving vehicles, running trains, and ships and boats can evacuate easily

2) Provision of facilities with tsunami protection function

- To substantially complete the compiling and publicizing of coastal conservation area registers, the inspection and performance evaluation such as earthquake resistance studies of facilities with a tsunami protection function, and a review of the master plans for coastal conservation for important coastal zones
- To substantially complete the automation, remote control implementation or other upgrading of water gates in key regional function concentration districts[§] and promote the seismic retrofit and raising of levees in important coastal zones; and establish an improvement method suitable for each area
- To promote the raising of breakwaters at ports and harbors along important coastal zones

3) Promotion of tsunami protection measures for facilities located in coastal areas

- The managers of the facilities located near coasts will inspect their facilities with respect to safety against the expected tsunami height and take protection measures in cooperation with one another.
- The administrative authorities (e.g., port managers, regional development bureaus, maritime safety departments, district transport bureaus) and private sector stakeholders will draw up comprehensive tsunami protection plans and implement protection measures.
- To establish an organizational system for control to be activated in the case where a tanker or coastal facility storing a large volume of a hazardous and obnoxious substance (HNS) such as crude oil or LNG has been damaged by a tsunami; and implement

4) § Areas behind which there are facilities that are to perform crisis management functions such as relief and restoration (e.g., municipal government offices, police stations, fire stations, hospitals)

measures to prevent cargoes and small marine vessels from being swept away and protect other marine vessels
- To provide guidance to passenger ship operators so as to ensure safety of passenger ships in the event of a tsunami

4) Damage reduction through better land uses and better ways of living
- To recommend that developers incorporate damage mitigation measures into their integrated development plans for coastal areas in order to create communities that are highly resistant to tsunamis.
- To promote the application of the philosophy of damage mitigation to the siting, project methods and usage of public facilities
- To conduct studies on the requirements for disaster-resistant communities in order to reflect the findings in community planning and regional planning

(3) Post-tsunami measures

1) Collecting regional damage information
- To build an investigation system that can respond quickly in the event of a disaster
- To strengthen the system for exchanging damage information between the central and local governments
- To enhance information gathering ability by making more effective use of helicopters, etc.
- To construct an information collection system using artificial satellites
- To assist in establishing organizational systems for cooperation in collecting information in affected areas

2) Ensuring the availability of regional transportation networks in a time of disaster
- To promote the seismic retrofit of road bridges and the construction of high-standard arterial expressway and other road networks in order to secure the availability of emergency transportation roads that play an important role in relief activities and the transportation of relief goods
- To restore damaged roads quickly by, for example, removing obstacles from damaged roads and carrying out emergency rehabilitation
- To construct a system for managing information on the usability of port facilities in an integrated manner and providing such information to users
- To promote the construction of earthquake resistant seawalls at ports in important coastal zones; and to improve detection systems using the laser-based depth measurement technology and other related technologies and establish systems for urgent removal of obstacles on sea routes that can be activated in conjunction with the detection systems

3) Promoting measures related to isolated areas
- To upgrade the functions of facilities that can be used as disaster prevention bases, such as tsunami/storm surge disaster prevention stations, river disaster prevention stations, Michi-no-Eki stations, coastal disaster prevention bases, located in the areas in important coastal zones where such functional upgrading is necessary, and promote the construction of such facilities; and to collect information that can be used to assist in disaster prevention efforts, and share such information among the organizations concerned
- To establish systems for wide-area joint operations involving the administrative authorities concerned

- To select emergency heliports and share the information on such heliports
- To build a system for cooperating with NGOs
- To enhance the rescue and relief capability of helipcopters

4) Strengthening restoration and rehabilitation measures

- To promote the research and development of equipment for disaster response operations such as debris removal and strengthen the institutional framework for providing assistance
- To improve rehabilitation assistance measures for disaster-resistant areas
- To strengthen the ability to pick up and transport people rescued from the sea

(4) Accumulation and dissemination of technology and knowledge for tsunami disaster prevention

1) Accumulating technology and knowledge for tsunami disaster prevention

- To promote disaster prevention education at schools, provide assistance for the education of community leaders in the area of disaster prevention and conduct comprehensive tsunami response drills every year in order to maintain and enhance public awareness of the importance of disaster prevention efforts
- To prepare pictorial illustrations showing expected tsunami behavior on the land or in the sea at ports in important coastal zones
- To construct a three-dimensional database integrating the information on terrestrial and submarine topography
- To compile high-accuracy terrain data for important coastal zones
- To establish a system for sharing information related to tsunami disaster prevention

2) Tsunami disaster prevention research and use of research findings for administration

- To conduct research on tsunami disasters drawing on expert knowledge and build a system for reflecting research findings in administration on a continual basis
- To promote research on the following:
  mechanism of tsunami generation; tsunami behavior on the land and in the sea and the spread of damage; building behavior in response to tsunami and control methods; strength performance of structures against tsunami; rehabilitation policies and methods of rehabilitation planning and implementation; study on the content of information and appropriate communication methods, etc.

4. MEDIUM TO LONG RANGE GOALS AND TSUNAMI PROTECTION MEASURES

The goal of tsunami protection measures is to minimize tsunami-induced damage including property damage.

Humankind is destined to inherit tsunami risk from generation to generation. The best way to mitigate tsunami damage, therefore, is to incorporate damage mitigation measures into land uses and the way of living in each of future generations so that the philosophy of damage mitigation is reflected in daily life.

In this country, which is not blessed with geographic conditions from the viewpoint of tsunami disaster prevention, it is necessary to make consistent efforts to raise the level of protection in areas where key community functions or key economic and social functions are concentrated. At the same time, it is necessary to implement various measures making effective use of every community planning and building construction opportunity in order to prevent destructive damage even in the event of a beyond-design-basis tsunami.

Furthermore, it is also important to reduce the use of high-tsunami-risk areas as living zones and steer land use so that living zones occur more in low-tsunami-risk areas than in high-risk areas.

Japan has entered an era of population decline, and it is predicted that the population of Japan will begin to gradually decrease in about 20 to 30 years and the demographic composition will change considerably. During the same period, sea level is expected to rise because of global warming. In order to cope with these unprecedented changes in changes in demography and natural conditions, it is necessary to accumulate and utilize scientific and technological knowledge and take appropriate measures.

In any case, a new policy is essential, and various institutional systems need to be constructed with the understanding of the public.

In accordance with these requirements and taking into consideration the expected changes in demography and natural conditions, medium to long range measures that should be taken over a period of about 20 years have been identified with the aim of "minimizing tsunami-induced damage and suffering including property damage."

(1) Medium to long range tsunami protection measures including emergency measures

1) Warning and information provision

- To develop methods for estimating the magnitude of tsunami-induced earthquakes to enhance the accuracy of tsunami forecasting
- To perform recomputation of tsunami simulation reflecting the effects of topography and land use changes
- To establish a system for providing information on areas that are likely to be flooded immediately in the event of a tsunami and enhance the accuracy of prediction

2) Preventive measures

- To construct shelters and evacuation routes to help to eliminate difficult-to-evacuate areas
- To perform the seismic retrofit of coastal conservation facilities, construct seawalls and breakwaters, and perform the automation and remote control implementation of water gates at openings, on an as-needed basis, mainly in important coastal zones
- The managers of the facilities located near coasts will take necessary measures.
- To promote the formulation of land use plans (municipal plans) that give consideration to disaster prevention

3) Post-tsunami measures

- To construct systems for urgent removal of obstacles such as sunken ships in port areas throughout the country
- To construct facilities that can be used as disaster prevention bases in the areas where such facilities are necessary
- To establish the technology and support systems for equipment for disaster response operations such as debris removal

4) Accumulation and dissemination of technology and knowledge for tsunami disaster prevention

- To establish functional maintenance methods and design technology for various facilities subjected to beyond-design-level external forces
- To promote widespread use of the knowledge gained and the research results obtained in administrative authorities and society

(2) Measures that take demographics into consideration

- To improve assistance to the growing number of people in need of assistance in the event of a disaster
- To upgrade the measures designed to steer land use so that living zones occur in low-tsunami-risk areas than in high-risk areas

(3) Measures against sea level rise due to global warming

- To decide on conservation measures to be taken as part of the tsunami protection measures against sea level rise
- To decide on measures to be taken in order to create a country and economic and social systems that are highly resistant to increases in external force caused by natural disasters

CONCLUSION

The recommendations described in this document are the first of their kind to deal specifically with tsunami protection measures. It is significant that the Tsunami Protection Committee deliberated on the varied themes falling into the categories normally covered by the National Land Development Council, the Infrastructure Development Council and the Council for Transport Policy, addressed short- and long-range policies under a clearly defined strategy, and has come up with a wide-ranging set of concrete measures to be taken.

In order to implement the recommendations, it is necessary to draw up action plans, carry them out, verify their effectiveness and, if necessary, modify them. It is also important to reflect the knowledge gained by analyzing the recent Indian Ocean tsunami in the administrative measures to be taken in the coming years. The challenge of developing new types of measures that need to be debated on a nationwide scale should also be taken up.

Tsunami protection measures that require follow-up as part of earthquake disaster prevention measures, should be implemented by more than one ministry or agency and require further deliberation should be implemented jointly by the ministries and agencies involved with the help of expert knowledge.

Whether or not these recommendations will have historical value is solely dependent on the efforts of not only the government but also the public and the various circles at various levels. Needless to say, the Ministry of Land, Infrastructure and Transport (MLIT) should promptly set out to implement the recommended measures that fall into the categories for which the ministry is directly responsible. In addition, MLIT should also present the other measures to the local public bodies concerned. Furthermore, MLIT should ask the local public bodies to report on the measures they have implemented or the measures they intend to implement, and should collect the reports and present the results to the public.

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