Japan's Disaster Management: Characteristics, Lessons and Challenges

Toshihisa Toyoda

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Introduction

This paper focuses on some issues of the recent developments in disaster management and policy in Japan. Throughout ancient and modern times, Japan has been sporadically hit by natural calamities due to its geographical and geological location. Moreover, when the country began to modernize, particularly after World War II, people flocked to industrialized areas and settled in congested urban districts, which made them even more vulnerable to disasters. Thus, Japan has long struggled to minimize disaster risk; the government, nongovernmental organizations (NGOs), researchers and related organizations, and individuals have amassed substantial knowledge and technology in this field. Japan's experience will have valuable impact on other countries, particularly developing countries that also have a high incidence of natural disasters.

This paper also stresses that past Japanese policy against disasters has not been necessarily good or satisfactory. However, after the devastation wrought by the Kobe Earthquake[1] of 1995, Japan resolved to improve its disaster management and significant evolutionary progress was observed. Under this background, the Great Eastern Japan Earthquake struck off the country's northeast coast on March 11, 2011. The tri-fold disaster of the great earthquake, the triggered tsunami and the nuclear plant accident has left some heavy lessons not only to Japan but also to the rest of the world.

1. Characteristics of Japan's Disaster Management and Policy

1.1 *Historical overview*

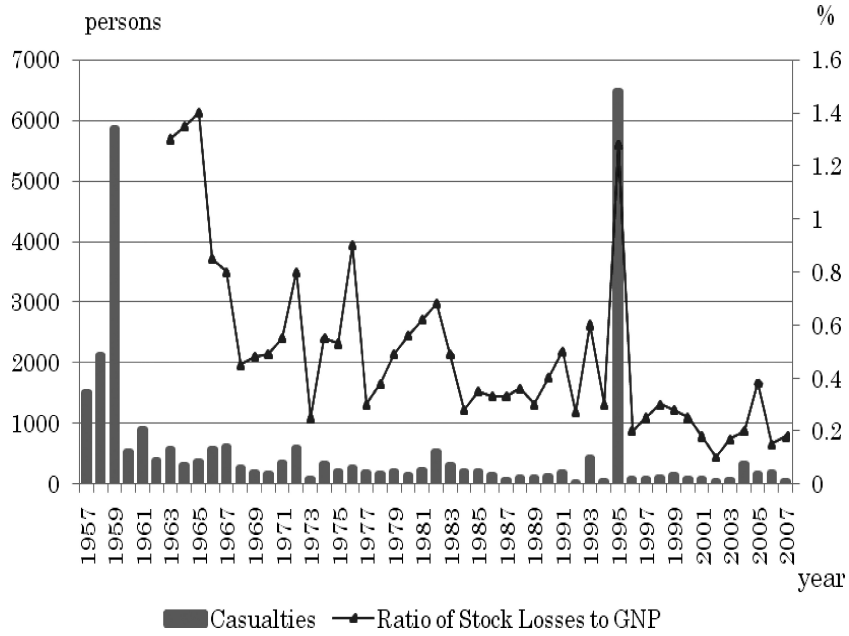
Judging by its geographical, geological, and meteoric profile, Japan is a crucible of calamities: earthquakes, tsunamis, volcanic eruptions, typhoons, heavy rains, floods, and

1) Actually, it is called Great Hanshin-Awaji (or South of Hyogo Prefecture) Earthquake, but for the sake of simplicity, I will just call it the Kobe Earthquake.

landslides. The disaster generating rate of Japan is very high, considering that its territory makes up only 0.25% of the Earth's land mass. Actually, a staggering 15% of the planet's total disaster damage is borne by the country for the period 1970–2004.[2)]

Meanwhile, social vulnerability has increased progressively since Japan became an economically developed nation. Population, assets, and urban activity have burgeoned in coastal areas, including some major bays. Big cities are crowded by rising populations and buildings that extend both upward and underground. Furthermore, as the aged population grows, so does the need for special support for the elderly during disasters. Away from urban centers, especially in the mountainous regions, the slowdown in population growth is more noticeable. Thus, the residents' disaster prevention capacity is rapidly eroding.

Since disaster risk emanates from natural calamities and social vulnerability, Japan's damage and casualty statistics ought to be one of the highest in the world. It is not. According to the historical data, the casualties and economic losses are comparatively low despite the fre-



Source: The author edited statistics in the Cabinet of Japan (2008).

Figure 1 Number of Casualties and Ratio of Stock Losses to GNP, 1957–2007

2) The economic damage value for the period 1970–2004 was calculated from the International Disaster Database of the Center for Research on the Epidemiology of Disasters. The data source is http://www.cred.be/.

quency of natural disasters. Figure 1 shows the number of casualties (persons) on the left vertical axis and on the right axis, the ratio of lost public infrastructure stock to the gross national product (GNP) from 1957 to 2007. The spike that appears in 1995, the year of the Kobe Earthquake, is to be expected, considering the destructive power of the quake. If we exclude 1995, however, both human and physical losses have been decreasing in the last 50 years.[3] This reflects Japan's efforts at implementing counter disaster measures. The stock values of the numerator of the ratio shown on the right axis do not include the loss of buildings, particularly dwellings. Note that the effects of the Great Eastern Japan Earthquake of 2011 have not been reflected in Figure 1.

1.2 *Characteristics of disaster countermeasures*

The setting up of legislative action for assisting disaster victims can be traced to the old law as far back as the 1880s.[4] A rescue fund was created in each prefecture in 1899, backed by subsidy from the central government. The worst disaster before World War II was the Great Kanto Earthquake of 1923, in which about 100,000 persons died, mostly in post-quake fires. The central government released a huge amount for the reconstruction of ruined Tokyo—almost as big as the national budget—and simultaneously undertook large-scale city planning.

When World War II ended, a series of great calamities hit Japan. The direction taken in establishing a rescue organization and funds was heavily influenced by the resolve to avoid the confusion resulting from each of the major disasters. The Nankai earthquake in 1946 affected a wide area in western Japan, and each prefecture fielded a different strategy to aid the catastrophe's victims. Thus, the Disaster Relief Act (1947) was enacted to standardize the disaster relief actions of municipalities (mainly prefectures) and clearly delineate the roles of the municipalities and the central government; the functions of related ministries and agencies were specified by low-rank statutes. Since then, this law has been the basis of public aid in the

3) It is conventionally believed that disaster risk decreases with economic development. Horwich (2000), for example, asserts that people can better prepare for disasters as their wealth increases (through savings and insurance), so that the society as a whole becomes safer. The case of Japan seems to validate this view at first glance, but as the next section explains, the downward trend in disaster losses has been attained mainly by government investment policy on public infrastructure rather than by private market mechanisms such as insurance provisions.

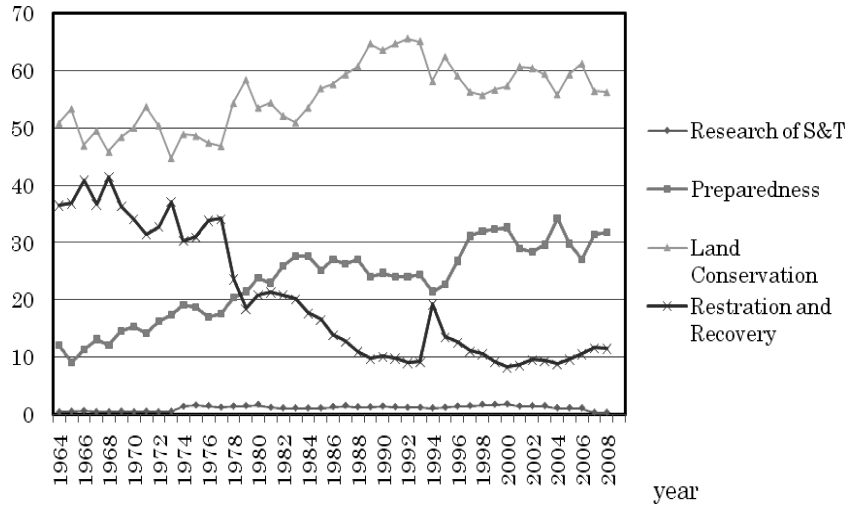
4) The law stipulates that the government should make provisions for food and other necessities when rescuing people who have been affected by a disaster.

"response" stage of the disaster management cycle.

The Ise Bay typhoon in 1959, which claimed 5,098 lives, prompted the enactment of the Disaster Management Basic Law (1961) to systematize disaster prevention and response. The new law incorporated provisions of the Disaster Relief Law. The scope of authority and duties of the related agencies, and some financial and monetary measures were specified. A year later, the Law Concerning Special Fiscal Aid for Coping with Devastating Disasters (1962) authorized the national government to increase its subsidy to municipalities when a "devastating" disaster occurred. As a market-oriented measure, the earthquake insurance system was introduced in 1966, after the Niigata earthquake of 1964. This is a reinsurance scheme, in which private insurers share the risk among themselves in paying claims to subscribers but the government pays a much larger proportion of claims if a single earthquake causes aggregate damage of over almost 1 trillion yen.

The country fine-tuned its disaster response system step by step, as it reacted to a succession of devastating calamities. The features of the system are: (i) the definition of the roles of the central government and municipalities, so that the responsibility is not concentrated on the national government alone; (ii) the definition of the jurisdiction of the relevant ministries and agencies; and (iii) a focus on the restoration of public utilities and facilities (consisting of engineering and construction work) when assisting people and affected areas.

Fiscal expenditures on all disaster-related sectors have been historically large. Their ratio to the general fiscal balance was about 8% in 1965 and has hovered at around 5% in recent years, although the trend has been downward. Figure 2 shows the changing patterns in the relative share of expenditure for the different disaster countermeasures in the last four decades. The damage reduction and preparedness measures in the pre-disaster period, and the response and reconstruction measures in the post-disaster period comprise the disaster management cycle. The revival and reconstruction expenditure reflects the share of allocated money in the post-disaster period. The other three items show the relative shares in the pre-disaster period. Although the share of post-disaster expenditures fluctuates considerably, due to the yearly differences in the real disaster occurrence, it has a decreasing tendency overall. In contrast, the share of expenditures on disaster reduction measures shows a significant and steady climb, having reached 20%–30% in recent years and already approximating post-disaster expenditures. Expenditures on disaster research (science and technology) have also been rising, but they remain smaller than the other items. Japan's expenditures on land conservation under disaster management are both sizable and flexible. The largest of the disaster-related budgets, at



Source: The author edited the figures in Cabinet, GOJ (2009).

Figure 2 Relative Shares of the National Budget in Disaster Countermeasures

50%–60% of the total, land conservation funds can be reallocated for reconstruction after big disasters.[5)]

The abovementioned features tell us partly why disaster damage in Japan has been shrinking in spite of the increasing frequency of disasters. There are two primary reasons behind this phenomenon. First, Japan has a long history of calamities, from which it has learned to allocate tax money for land conservation, such as land and river improvement, and the prevention of coast and river erosion, subsidence, landslides, etc.[6)] Second, great efforts have been exerted to direct public policy towards disaster prevention and reduction, including advances in weather survey and forecasting technology and improvements in the dissemination of information on disasters.

2. Evolutionary Development after the Kobe (Hanshin-Awaji) Earthquake

The Kobe Earthquake was tremendously ruinous in terms of causalities and lost physical stock of public infrastructure. It devastated Kobe and the cities surrounding it, one of the most

5) Less was spent on land conservation and more in reconstruction in 1971 (typhoons and floods), 1995 (Kobe Earthquake), and 2004 (Niigata-Chuetsu Earthquake).

6) A huge chunk of the budget is allocated to general construction every year, and some politicians and construction firms are known to have collaborated underground for their self-interest. This is a typical case of bad governance in public investment.

densely populated and highly industrialized areas of Japan. The magnitude of the convulsion was 7.3, and the epicenter was right beneath the urban area. The temblor killed 6,400 people, injured 44,000, and destroyed 460,000 homes (totally or partially). Some 317,000 people had to be evacuated to schools and public buildings. As can be observed in Figure 2, there was a sudden jump in reconstruction expenditure after January 17, 1995 — the date of the earthquake.

2.1 *Improvement of the disaster response organization*

The initial responses of both the national and local governments to the Kobe Earthquake were delayed. To compound the woefully slow response of the prefectural offices, almost all traffic and telecommunication systems, including satellite telecommunications, were destroyed. It took almost three days for the central government to grasp the extent of the damage. The affected cities and municipalities had a formidable task ahead of them, and they had to work hand-in-hand with or under the supervision of the upper hierarchical organizations, such as the Hyogo Prefecture and the central government. The confusion that ensued bared several weak points in Japan's disaster management organization.[7] To restore order, some degree of governmental reorganization had to be carried out. To address the delay in initial response, the central government established a cabinet information center. Also, the Disaster Management Bureau was elevated to Cabinet level and a Minister of State for Disaster Management was appointed. Furthermore, under the revised law, the prime minister can immediately set up the Disaster Countermeasures Field Headquarter. Although the organizational structure of the governmental response was improved, the response of the current government has not been working well at the face of this year's Great Eastern Japan Earthquake mainly because of it's political weakness.

One important issue is the role of the Japan Self-Defense Forces (JSDF) at emergency response periods of disasters. Under the existing protocols, the governor of a local prefecture has to request emergency support of JSDF and will only receive it if a state of emergency can be proved. At the time of the Kobe Earthquake, the Governor's request and effective communication with the central government was so delayed that JSDF were not sent in large numbers for four days, leading to many unnecessary deaths. Reflecting this failure, quick and effective appearances of JSDF have been observed in recent disasters. About half of the troops were sent to Tohoku area at the time of the Great Eastern Japan Earthquake in 2011, and they

7) There are several critical assessments on this issue. See, e. g., Kazama (1998).

received high appreciation and recognition for their effective and intensive work not only by the victims but also by the nation.

2.2 *Balancing the reconstruction of physical stocks and human lives*

The data analysis of Figure 1 cannot be applied to the Kobe Earthquake because most of the damaged stock was buildings, including dwellings. (The lost values of buildings were excluded from the infrastructure loss measured on the right axis in Figure 1.) The official estimated damage was placed at about ¥10 trillion or about US$85 billion, 60% of which was damage to buildings.

Visible public infrastructure or facilities were reconstructed at a very brisk pace after the Kobe Earthquake, thanks to the aforementioned budgetary system that had been put in place by the Law for Coping with Devastating Disasters, and to the temporary special arrangements that were made.

The reconstruction expenditure for the Kobe Earthquake began fiscal year 1994 (using the fiscal allowance) and continued all the way to the secondary compensation budget in fiscal year 2000, when the main part of the work ended. The total reconstruction budget of the central government reached ¥5.02 trillion; about 2/3 was spent on infrastructure revival and housing-related expenditure was about ¥1.1 trillion. Housing-related expenses included rubble processing, emergency temporary housing, and public rental housing construction. These could be classified as public facility expenditures, except for the subsidies for interest payments on housing loans and for the housing rentals of the people who had lost their homes. The soft side of economic revival—condolence money, welfare and educational support, and measures for small business—received a mere 12% of the total reconstruction budget, a clear indication the country's stand on emergency restoration and reconstruction in the hard side. However, in the budgets of the prefecture and cities, the item of expenditure relevant to life reconstruction does post a little increase. For example, a big part of the disaster budget of Hyogo Prefecture for two years had been allocated for hard reconstruction; only about 20% went to "soft" support for life relief, etc. Although the measures for revival continued until after fiscal year 2001, the budget earmarked for the purpose decreased substantially, and its composition was gradually

8) This activity has been conducted mainly through the Disaster Reduction and Human Renovation Institution, which was established by the Hyogo Prefecture and the national government. The institute' main activities are research, exhibitions, conferences, education, training of local government experts, and library services.

altered to accommodate disaster reduction and commemoration enterprises.[8)]

There were few records of official support for the revival or reconstruction of individual lives. During the recovery stage, a disaster victim first needs a residence then an occupation. About 460,000 households suffered housing damage judged as more than 50% damage. The number of jobless people also grew rapidly.

Although early financing was required for life revival, public cash support was not implemented in principle, except for the conditional distribution of donations and the small sum given to victims with severely damaged homes. The principle of "not carrying out individual compensation," which is peculiar to Japan, hinders personal property formation (e.g., a residence). The government has stubbornly clung to the practice for years.[9)] In the Japan International Cooperation Agency group training program for disaster management specialists of developing countries (where I work as a lecturer), this "principle" surprises the participants the most, and they are thus troubled by Japan's disaster management system.

Five years after the Kobe Earthquake, the Western Tottori Prefecture Earthquake struck. The governor of the prefecture, despite heavy contrary pressure from the central government, made the reconstruction of life, mostly for the elderly in the countryside, his top policy. Cash benefits had to be put at the victims' disposal for repairing their homes or constructing new ones. The governor decided to issue public (prefectural) bonds for the purpose.

Eventually, the national government changed its position on the issue. The strong clamor of citizens (specifically, those affected by the Kobe Earthquake) and the obvious plight of disaster victims who had lost dwellings in the calamities that followed finally persuaded politicians (members of the Diet) to unanimously amend Natural Disaster Victims Relief Law in 2007. The amended law allowed cash support of up to ¥3 million for reconstructing severely collapsed residences. However, the much-awaited amendment was not applied to the victims of the Kobe Earthquake, as most of the housing reconstruction in the area had been accomplished through self-help.

The above-mentioned amended law began to be applied to any kinds of large-scale disasters which occurred in 1999 and thence. Although there remain some limitations of applicability of the law, this amendment was a symbolic change in Japan's disaster management thought and practice toward a more heavy weight of reconstruction of victims' livelihood. Confronted

9) Probably, central government bureaucrats insist on retaining this "principle" because they fear that, should cash benefits be awarded to victims of major calamities, the government's coffers would be emptied by the next big earthquake to hit the likes of metro Tokyo.

with the Great Eastern Japan Earthquake, there were many discussions how to ease the limitations of applicability of the law in addition to the ones how to finance post-disaster reconstruction in general.

2.3 *Improvement of the disaster information system*

At the time of the Kobe Earthquake, it was difficult to transmit information promptly because some telecommunication systems were destroyed and elsewhere, congestion and interruptions on communication networks occurred. More importantly, it was just before internet and mobile-phones rapidly spread when the disaster occurred.

Fortunately, the recent strides in telecommunication infrastructure have been remarkable. The Japan Meteorological Agency and local governments have developed some 3,000 seismic intensity observation points nationwide. Based on the information generated by the observation points, the government developed the Early Estimation System and Emergency Measure Support System. The Agency introduced the urgent earthquake alarm system in 2007, which immediately broadcasts through television and radio the occurrence of an earthquake that has a seismic intensity of three or higher.[10)]

2.4 *Important role of volunteers*

In 1995, volunteers from different parts of the country went to Kobe to help with earthquake relief operations (sometimes called the "volunteer first year" of Japan). The volunteers, who worked there for 13 months after the occurrence of the disaster, numbered about 1,400,000 (Hyogo Prefecture announcement). Around 60% were students. Moreover, based on the questionnaire circulated by the Hyogo Prefecture, 70% of the volunteers were doing it for the first time.

Among local volunteer organizations, networks (e.g., an independent liaison council) were created for information exchange and mutual administration. Some organizations that emerged in the affected area specialized in disaster relief and reconstruction, and continue to offer active support service to victims of serious disasters in Japan and abroad.

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10) Small tremors called P waves and big tremors called S waves occur at the same time, but their speeds are different. Based on the observation of P waves at some point and using propagation velocity difference between S and P waves, they predict a seismic intensity there. The earthquake early warning was put into announcement 17 times since its start in October 2007 until the Great Eastern Japan Earthquake and performed fairly well. But, after the Easter Japan, the system has a tendency to respond too sensitively and over-predict. The system should be improved further.

2.5 *Community-based disaster management*

Many local municipalities have enacted or amended local area disaster prevention planning. The initiatives are progressing in the direction of the concept that an "area," which plays a vital role in revival and disaster reduction, denotes a community, not necessarily a municipality.

With respect to reconstruction in the urban districts affected by the Kobe Earthquake, there were sometimes wide gaps between the local government's proposals and the plans readied by district residents. Each district used many different approaches. In several districts, community development councils (about 100 councils) were created; initial opposition shifted to collaboration after numerous discussions. In some cases, a prominent member of the community would assume leadership and approve the government's proposals without much objection. In fact, community members should indeed play a leading role in their communitiesco. A common expression is *machizukuri* (community development through collaboration), which means that the resident and the authority work together (Shiozaki et al. [25], p. 101).

Recent earthquakes in Chuetsu (2004), and Iwate and Miyagi Inland (2008) occurred in areas surrounded by mountains. The residents of the affected areas had community consciousness, so that community-based reconstruction projects are easier to implement here than in Kobe.[11)]

Recently, community-based disaster reduction and reconstruction have entered the mainstream of disaster management in Japan and elsewhere in the world. The UNCRD (2004) and World Bank (2006) are good examples of mainstreaming and practicing community-based disaster management. Okada and Hiraoka (2008) also explain the importance of community-based disaster reduction management, with special emphasis on the training of professionals.

Finally, I would like to mention Japan's traditional fire brigade, the fire-fighting organization of a community (be it a city, town, or village). Fire brigade members usually hold a regular jobs elsewhere, becoming civil servants (part-time volunteer service) only when disasters occur. They assist the professional fire-fighting force in protecting and rescuing residents from fires, earthquakes, floods, etc. In everyday life, brigade members also instruct households on fire prevention and conduct fire drills. In the countryside, where there are sometimes no fire stations and professional fire fighters, the fire brigade is the sole emergency organization in the

11) The 2008 Sichuan Earthquake in China was very powerful and spherically extensive, affecting both urban and rural communities. Reconstruction plans varied from area to area. Some communities (or towns) situated between mountains had to uproot and move to very far but flat sites because of the severe damage caused by the earthquake and the threat of landslides.

community. Almost all municipalities nationwide have fire brigades. This traditional system should have been an important factor to keep the country resilient to calamities.

3. International Cooperation for Disaster Management and Prevention

After the earthquake, Hyogo Prefecture and Kobe City became the base of international disaster prevention activities. The highlight was the United Nations World Conference on Disaster Reduction, which was held in Kobe in 2005. The "Hyogo Framework for Action 2005–2015,"[12] which was cobbled together in the conference, has provided the fundamental indicator of disaster prevention activities in the international society for 10 years. The conference produced the framework of international disaster prevention cooperation; the participants agreed that damage reduction must be the world's common disaster management target when drafting sustainable development policy (Cabinet of Japan [2000]). To properly apply the framework, the assistance of the UN disaster prevention strategy (UN/ISDR) will be needed, as well as the cooperation and adjustment of the organizations concerned in each field. To implement the agenda of the Hyogo Framework (i. e., the inclusion disaster prevention concepts in the revival process), the international reconstruction assistance platform was installed, in cooperation with related international organizations. These activities are being undertaken at the new urban core in eastern Kobe.

Much improvement in accepting various assists from overseas to Japan has been observed just after the Great Easter Japan Earthquake. 24 countries sent the emergency support teams including 13 countries with rescue dogs. At the time of the Kobe, the Japanese government lost several days to determine the acceptance of foreign rescue teams and eventually only Switzerland and France came to search dead bodies with rescue dogs. In this connection, I think that Japan should promote a new and innovative framework of international cooperation of disaster management including emergency support with foreign countries, particularly with China and Korea, the Japan's important neighboring countries; 48 hours are crucially important to save victims' life.

I think that Japan's thrust on disaster prevention and emergency restoration support extend beyond its linkup with related international organizations; the country must acknowledge disaster prevention and management as an important field in international cooperation. In develop-

12) See ISDR (2005) for more detail.

ing countries, such as those in Asia, there is a vicious circle in disaster management: public funds are scarce, particularly for preventing and mitigating disasters; in turn, the impact of a disaster tends to be heavier, thus worsening poverty. To help developing countries break the negative cycle, they must be trained in various fields of disaster management and encouraged to be self-reliant (Cabinet of Japan [2008], p. 238). Admittedly, though, there is a hard side to the issue, such as proper and adequate infrastructure for disaster prevention. In disaster-prone Japan, there are many places wherein foreign specialists can inspect actual stricken areas and visit related facilities, government offices, and universities.

No country has thorough countermeasures against calamities, not even Japan. Normally, a revival fund has restrictions. During international cooperation initiatives involving technology transfer on disaster prevention and management, Japan's best practices and "bad examples" should both be taught.

Conclusions

This report first reviewed the step-by-step improvement in Japan's disaster policy. It was the powerful Kobe Earthquake that ushered in a new era in disaster response. The quake became the benchmark in disaster prevention and management, particularly as regards the coordination between the government, community, and citizenry during the recovery phase. The great damage wrought by the temblor should be a constant reminder to try to reduce such huge losses in money, assets, and human lives. Developing countries that are disaster-prone are likely to experience similar devastation; more international cooperation is needed in this field. Japan, one of the leaders in the area, is already playing an important role.

Both traditional and modern schemes of Japan's disaster management - at least some of them - can be shared with other countries. They are summarized as follows:

① An example is the fire brigade concept: Volunteers are trained and organized into a community-based team that helps protect the locality against any kind of major calamity.

② Based on the past experience, the Japanese government allocates its considerable amounts of annual budget to land conservation. If a great disaster occurs, some of them are reallocated for reconstructing damaged public infrastructures.

③ Japan's insurance system works quite well so far compared with other countries although its subscription rate is still low.

④ Early warning systems against tsunamis and earthquakes, already operational in Japan, will hopefully be used worldwide in near future.

⑤ Japan is one of the leading countries which pursue disaster risk reduction along the spirit of the Hyogo Framework. Japan has learnt, particularly after the Kobe quake that a country must make its reduction priority and develop or modify policies, laws, and organizational arrangements to integrate its reduction. It must also allocate sufficient resources to support and maintain them. Collaboration and cooperation among all stakeholders are crucial both to disaster risk reduction as well as disaster recovery and reconstruction: the government, civil society including volunteers, community-based organizations, the academic, and the media, and the private sector all have a role to play.

⑥ The Great Eastern Japan Earthquake of 2011 has left at least two heavy lessons to Japan and also to the rest of the world. First, "soft" preparedness for tsunamis, which include evacuation drills, escape routes and towering shelters, should be most important for coastal residents. Even some 10 meters high seawalls, which were believed to be "hard" enough, could not protect countless damage of both physical and human lives. Secondly, we have learnt that nuclear power stations, particularly aged ones, are not safe against many safety messages advocated by specialists.

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References

Asian Disaster Reduction Center (2007), *Promoting Public Private Partnership in Disaster Risk Reduction*.

Asian Disaster Reduction Center, *Annual Report*, various issues, 2003–2008.

Government of Japan, Cabinet Office, *White Paper on Disaster Prevention*, various issues, 1996–2009 (in Japanese).

Horwich, G. (2000), "Economic Lessons of Kobe Earthquake," *Economic Development and Cultural Change*, 48(3), 521–542.

Hyogo Prefecture (2006), *Report on the Survey Research on Livelihood Reconstruction* (in Japanese).

International Strategy for Disaster Reduction (ISDR), United Nations (2005), *Hyogo Framework for Action 2005–2015: Building the resilience of nations and communities to disasters (HFA)*.

International Strategy for Disaster Reduction (ISDR), United Nations (2007), *Learning from Disaster Recovery: Guidance for Decision Makers*.

Kazama, N. (1998), "Emergency Management Policy in Japan: The Failure of Policy Network, " *Annual Report of the Japan Society for Public Policy*, 1–25 (in Japanese).

Okada, N. and K. Hiraoka (2008), "Formation of Asian Comprehensive Disaster Reduction Technology—Making Participatory Disaster Reduction Management as a Main Stream in Development Assistance," *Report of Research Institute of Development Finance*, JBIC, 36, 2008, 220–240.

Shiozaki, Y., E. Nishikawa and T. Deguchi, eds. (2005), *Lessons from the Great Hanshin Earthquake*, Creates Publishers.

Shiozaki, Y., E. Nishikawa and T. Deguchi, eds. (2009), *A Guide for Human Recovery from Natural Disaster*, Creates Publishers (in Japanese).

Toyoda, T. (2008), "Long-term Recovery Process from Kobe Earthquake: An Economic Evaluation," Toyoda, T. and T. Inoue, eds., *Quantitative Analysis on Contemporary Economic Issues*, Kyushu University Press, 148–166.

UNCRD Disaster Management Planning Hyogo Office (2004), *Sustainable Community Based Disaster Management (CBDM) Practices in Asia, A Users Guide*.

World Bank (2006), *Main Stream Hazard Risk Management into Rural Projects*.