

Recommendations for International Collaboration on Natural Hazard Reduction

Dr. Tsuneo Katayama & Dr. Kenji Satake
Science Council of Japan

About the authors

Dr. Tsuneo Katayama

Member of Science Council of Japan

President

Independent Administrative Institution

National Research Institute for Earth Science and Disaster Prevention

Educational Background

Ph.D. University of New South Wales, Sydney, Australia

Professional Career

Professor, Institute of Industrial Science, University of Tokyo (1982-1996)

Director, International Center for Disaster-Mitigation Engineering,

Inst. of Industrial Science, University of Tokyo (1991-1996)

President, National Research Institute for Earth Science and Disaster Prevention
(1996-Present)

Dr. Kenji Satake

Member of Science Council of Japan

Deputy director of Active Fault Research Center (AFRC), National Institute of Advanced Industrial Science and Technology (AIST)

Educational Background

Bachelor of Science and Master of Science, Hokkaido University, 1982, 1984

Doctor of Science, University of Tokyo, 1987

Professional Career

Tokyo Institute of Technology, Research Assistant, 1985-1990

California Institute of Technology, Visiting Research Associate, 1988-1990

University of Michigan, Assistant Professor, 1990-1995

Geological Survey of Japan, Senior Researcher, 1995-2001

National Institute of Advanced Industrial Science and Technology (AIST), AFRC, Team Leader 2001-2003, Deputy Director of AFRC 2003-

International Union of Geodesy and Geophysics Tsunami session, Chair, 2003-

Asia Oceanic Geosciences Society, Secretary General, 2004-

Science Council of Asia (SCA):

was established in May 2000 among 10 Asian countries for the purposes: to exchange information on current status of science; to promote collaboration and cooperation in a wide range of field of science in the region. Now with membership of 19 organizations of 11 countries SCA works together for sustainable development: a prosperous, harmonious and greener Asia. The members are shown at the last part of this booklet.

Contents:

1. Foreword
2. Executive summary
3. Recommendation for natural disaster reduction

General

- (1) Raise awareness and formulate disaster reduction policies
- (2) Encourage wider international and interdisciplinary collaborations

Save vulnerable people

- (3) Poverty alleviation
- (4) Secure people's livelihoods as well as their lives
- (5) Women, children, the aged and handicapped.

Promote community based disaster management

- (6) Community based disaster management
- (7) Best available predictive and preventive systems and technology
- (8) Power of each individual

Promote research and outreach

- (9) International collaborative research
- (10) Outreach

On the 2004 Giant earthquake and tsunami

- (11) Research and international collaboration
- (12) Cost-effective tsunami warning system

Appendix A: List of contributors

Appendix B: Symposium report

Appendix C: SCA joint program summary

Appendix D: SCA information

Foreword

It is my great pleasure to publish this booklet, the report of the SCA Joint Projects, 'Natural Hazards Reduction: Recommendations for International Collaboration'

The agenda of the Science Council of Asia.

The Science Council of Asia (SCA), founded in 2000, brings together scientists and scientific organizations from all academic fields, including the cultural and social sciences as well as the natural sciences, technology, and health care, to achieve the following aims:

- To exchange information among Asian countries on the current status of science;
- To promote collaboration and cooperation in a wide range of fields in the sciences in the Asian region;
- To deepen understanding and trust among scientists in Asia.

The SCA Joint Projects are research projects on scientific issues promoted by two or more researchers under the leadership of anchor organization of member countries. The objective of the projects are i. to share experiences, ii. to promote collaboration, and iii. to achieve common goals of the SCA.

This SCA report *Natural Hazards Reduction* is anchored by the Science Council of Japan, presented by Professor Satake, and proposed and approved as SCA Joint Project at the 5th SCA meeting in Hanoi, May 2005. Scientists and experts in the subjects rich in expertise and experiences with partial grant supports from Japanese government and elsewhere worked together effectively and developed this Report. They with to share their experiences with scientists, engineers, policy makers, and others of the member organizations and 11 member countries so that specific recommendations in this SCA Joint Project will be considered for implementation for Natural Hazards Reduction.

We believe the SCA, representing science communities of 11 countries, wishes to serve the people of member countries, the region and the world and to further extend our contribution for Sustainable Development to a Prosperous, Harmonious and Greener Asia.

March 2006



Kiyoshi Kurokawa
Secretary General
Science Council of Asia

Executive Summary

Following the devastating earthquake and tsunami damage in Asia in December 2004, a joint project on natural hazards was authorized at the 5th Science Council of Asia meeting in Hanoi, Vietnam, in May 2005. The goal of the project is to make policy recommendations from Science Council of Asia to governments of disaster-prone countries.

During December 14-17, 2005, “Memorial Conference on the 2004 Giant Earthquake and Tsunami in the Indian Ocean” was held in Tokyo with 178 participants from 11 countries in Asia and 2 international organizations. The Conference was co-organized by the National Research Institute for Earth Science and Disaster Prevention, the Earthquake Research Institute of the University of Tokyo, and the Disaster Prevention Research Forum, and was supported by Ministry of Education, Culture, Sports, Science and Technology, and Science Council of Asia.

The second part of the conference was “the International Symposium on Proposals toward International Collaboration for Disaster Reduction.” The importance of such a symposium was recognized at the World Conference on Disaster Reduction (WCDR) convened by the United Nations’ International Strategy for Disaster Reduction (ISDR) in Kobe in January, 2005. The WCDR endorsed the Hyogo Framework for Action and the UN General Assembly adopted it in 2005. The Hyogo Framework for Action is a roadmap for disaster risk reduction in the next 10 years, based on substantial review on disasters and disaster reduction efforts during the last 10 years. The main goal is to implement systematic and concrete actions in disaster risk reduction.

Representatives of the countries most affected by the earthquake and tsunami in the Indian Ocean presented the extents of the damages and the processes of the recovery operations undertaken over the preceding twelve months. Scientists from various fields reported on recent advances in technology and how it could be best deployed to prepare for future similar disasters. Local and international experts in disaster emergency management from non-government organizations as well as academia affirmed the importance of recognizing and augmenting the capacity of communities to mitigate future disasters.

The last session of the two-day Symposium was devoted to discussions among panel members and the audience on the nature of the vulnerabilities facing Asian countries

and the need to seek a common framework to reduce their peoples' exposure to disasters. Acting on the advices and directives from these discussions, the following recommendations have been formulated for further comments and amendments. We offer twelve proposals as a recommendation.

Recommendations

General:

Proposal 1:

Governments should be aware of increasing impact of natural hazards on societies and different risks and resources that exist within the Asian countries, and formulate disaster reduction policies relevant to their particular vulnerabilities and capacities.

Proposal 2:

Encourage wider international and interdisciplinary collaborations among natural scientists, engineers, social scientists, experts from private sectors and other key stakeholders when formulating disaster reduction policies.

Save vulnerable people:

Proposal 3:

Emphasize that poverty alleviation is one of the most decisive disaster reduction measures that any nation or agency should consider.

Proposal 4:

Take measures to ensure that disaster reduction programs secure people's livelihoods as well as their lives.

Proposal 5:

Recognize that women, children, the aged and handicapped are especially vulnerable to disasters and ensure that their needs and capacities should be taken into special consideration in all disaster reduction projects to empower them.

Promote community based disaster management:

Proposal 6:

Foster the sharing of knowledge about and adoption of community based disaster management at all levels of disaster reduction – the local, national and international.

Proposal 7:

Utilize the best available predictive and preventive systems and technology for disaster mitigation that are appropriate and cost-effective to local conditions which are well adapted to community needs.

Proposal 8:

Stress the importance of the power of each individual to make a difference in disaster reduction.

Promote research and outreach:

Proposal 9:

Promote advanced international collaborative researches on mechanisms & impacts of natural disasters, and on countermeasures, recoveries, and reconstruction plans.

Proposal 10:

Encourage outreach through education, training and the media and ensure that it is made a central feature of all scientific, technological and management practices and research outputs.

On the 2004 Giant earthquake and tsunami:

Proposal 11:

Promote research and international collaboration to understand the mechanism and to forecast the future events similar to the 2004 giant earthquake and tsunami.

Proposal 12:

Develop cost-effective tsunami warning system in the Indian Ocean through international collaboration and using existing capacities.

Recommendations for natural hazard reduction

Introduction

The earthquake and tsunami of December 26, 2004, caused tremendous damage to the countries surrounding Indian Ocean. Peoples in the heavily-stricken areas are still suffering from the disasters, and the restoration process is expected to take a long time.

Some Asian countries as Japan, the Philippines, Indonesia, Bangladesh, etc. have suffered from innumerable natural hazards including earthquakes, tsunamis, volcanic eruptions as well as typhoons/cyclones, floods and coastal erosion which have produced great human and property losses.

After the tragedy caused by the Indian Ocean tsunami, many Asian researchers, practitioners, government officers as well as community leaders realized the importance of sharing experiences against natural disasters among peoples in disaster-prone Asian countries.

Following the discussions at “the International Symposium on Proposals toward International Collaboration for Disaster Reduction” held in Tokyo during December 16-17, 2005, twelve proposals have been formulated for decision makers.

It should be emphasized that a set of these proposals is not the goal of the joint project of SCA but the beginning of wider and stronger collaboration among SCA member countries. These proposals should be continuously reviewed and revised for establishing safer and more secure society against natural disasters.

Scopes of proposals

General:

Proposal 1:

Governments should be aware of increasing impact of natural hazards on societies and different risks and resources that exist within the Asian countries, and formulate disaster reduction policies relevant to their particular vulnerabilities and capacities.

It must be recognized that natural hazards in a country or a community are strongly influenced by its tectonic, geological, and meteorological environments. Natural hazards in Asian countries are versatile. They include earthquakes & tsunamis, volcanic eruptions, landslides & debris flows, typhoons & cyclones, floods, tidal waves, coastal erosions, snow & ice disasters, etc.

The effect of these natural hazards to human community varies depending on the vulnerability and capacity of the community, which is the resultant of the natural environment and the development by human activity. It is proposed that the governors and local governors of a specific region be aware of the impact of these natural hazards and formulate disaster reduction policies to protect the lives, livelihoods, and properties of the people in the region.

In addition, the regional differences in traditions and cultures should be considered for disaster risk and management planning. When developing community based strategies, outside specialists often overlook community's disaster-resilient capacities based on its historically cultivated traditions. Such disaster-resilient and disaster-resistant capacities are often found in the communities' folk-lore and/or traditional cultural activities. Also, as the socio-economic state of an area makes development, communities are better informed and therefore better prepared. The community's existing capacity should be the starting point for establishing risk reduction strategies. Ideally, such strategies should seek to strengthen existing capacities rather than to introduce new ones.

Linking relief to development through protracted engagement with the community in building social capital, restoring livelihoods, securing shelter and improving health and education levels would bring about greater resilience to disasters. The role of external agencies is to facilitate concerned communities with the state-of-the-art knowledge and

technologies.

Proposal 2:

Encourage wider international and interdisciplinary collaborations among natural scientists, engineers, social scientists, experts from private sectors and other key stakeholders when formulating disaster reduction policies.

When it is necessary to make a disaster reduction policy for natural hazards, the following procedure is essential:

- 1) to understand the mechanism of the hazard,
- 2) to quantify its effects to human lives and engineered structures,
- 3) to propose appropriate structural and non-structural countermeasures by considering its magnitude and frequency, and the socio-economic condition of the community, and
- 4) to implement the countermeasures in the community.

In this procedure, natural scientists, engineers, social scientists, experts from private sectors and key stakeholders must be equally involved. Hence the interdisciplinary collaboration among them is extremely important from the early stage of policy making.

Save vulnerable people:

Proposal 3:

Emphasize that poverty alleviation is one of the most decisive disaster reduction measures that any nation or agency should consider.

Poor people in developing countries live in the areas most vulnerable to natural disasters. They are obliged to live under the constant threat of hazards, without often realizing the risk they are facing. When impacted by a disaster, they may lose their lives as well as their properties. Those who narrowly survived have no way but to join the flock of disaster refugees.

International and local experts organize workshops and seminars to develop public awareness to natural disasters, but such attempts have rarely been successful to reach the people in real need. Majority of the vulnerable cannot utilize the knowledge, know-how and equipments, even if they are offered. Disasters due to Hurricane Mitch in the Central America (1998), disasters due to debris flows in the state of Vargas in

Venezuela (1999), flood disaster in Mozambique (2000) and even the flood disaster in the estuary of the Mississippi in the USA (2004) seem to well assert this.

Disaster prevention and mitigation projects in the past demonstrate that, without a successful mechanism for income generation, most of these projects loose momentum it has at the beginning. This means that the donor have to continue injecting aids disregarding cost effectiveness. “God helps those who help themselves” is applicable here for the sustainable developments of disaster resilient communities.

The initiatives and activities for rescue, relief, rehabilitation and recovery must be undertaken in a well-planned sequential manner in order to help a society acquire resilient and resistant capacity against hazards. A good disaster management cycle must best utilize lessons learned through a disaster to help survivors follow the cycle from the emergency phase to the development phase. In many of the past cases, however, the sequential cycle stopped soon after the emergency phase. Knowledge and know-how are often futile, if people do not have resources to put them into practice.

Proposal 4:

Take measures to ensure that disaster reduction programs secure people’s livelihoods as well as their lives.

Disasters not only take human lives but also their livelihoods. People’s vulnerability is determined by identifying the totality of environmental, economic, social and political dimensions of risk that detract from their capacity to withstand and recover from adverse events. It is an individual, household or group’s access to resources, their entitlements and endowments that determine their ability to maintain an adequate level of living. Access, in turn, depends on the nature of the linkage between people’s differential capabilities, assets and activities and their options as sanctioned by laws, rules and societal norms and delimited through social relations such as class or gender. Disasters of all persuasion, whether slow or sudden onset, put the strategies people adopt to maintain or enhance their livelihoods at risk by disrupting these linkages and damaging their ability to recovery from and prepare for the next extreme event.

The East Bengal cyclone and accompanying storm surge that hit East Pakistan (now Bangladesh) in November 1970 and caused between 225,000 to 500,000 human deaths (or a mean mortality of 16.5%). It also drowned about 60% of the entire cattle population within an area of approximately 5000 km². Six months later a survey

revealed that the amount of land under cultivation had fallen from 20% to only about 6% within the affected zone.

Effective disaster reduction programs should recognize this important causal relationship and take adequate steps to ensure not only that people's lives are saved but that their livelihoods are, too, in terms of access to land, tools of trade, market outlets and means of transportation. Moreover, in the extensive rural hinterlands of most developing countries where livelihood often depends on domesticates, too little attention is paid to the imperatives of preserving animal populations as well human ones.

Proposal 5:

Recognize that women, children, the aged and handicapped are especially vulnerable to disasters and ensure that their needs and capacities should be taken into special consideration in all disaster reduction projects to empower them.

Hazardous disaster attacks all lives and livelihoods, and in case of emergency, the response and recovery schemes are mostly focused on infrastructures, and economic and public systems. However, it should be noted that the most heavily affected usually are women, children, the aged and handicapped - the most vulnerable group of people in communities.

To avoid tragic disasters, including some secondary problems like violence and kid-napping, all risk and crisis management plans should pay more attention to these people. For example, the highest priority in evacuation schemes, shelter and food supply should be given to these people. Moreover, physical and mental support for these people should be prepared as a part of public assistant systems.

Promote community based disaster management:

Proposal 6:

Foster the sharing of knowledge about and adoption of community based disaster management at all levels of disaster reduction – the local, national and international.

The impacts of natural hazards are strongly related with the socio-economic conditions, tradition, culture, and climate of the affected communities. Community based disaster management (CBDM) should be advocated and institutionalized because: 1) local people are potential victims and assume responsibility in managing the risk; 2) local people respond first and are the last remaining to rebuild safer communities; 3) disasters reflect local conditions, of which local people are aware; and 4) people can be motivated for disaster management through risk communication at local level.

Local population would have local knowledge regarding vulnerability and capacity conditions. There are several traditional coping mechanisms suited for their specific environment that they have developed from previous experiences in dealing with disasters. CBDM strengthens social cohesion and cooperation within the community and society. It builds confidence among individuals, households, communities for any undertaking including disaster preparedness and mitigation.

For sustainability of CBDM, the following factors would be important:

1. Existence of a “culture of coping with crisis” and “culture of disaster reduction”;
2. Risk assessment process involving participation of people and incorporating their perception of vulnerability and capacity;
3. Community and supporting agencies sharing common motivation and ownership for the initiation and sustainability of CBDM;
4. People’s participation within capacity-building objectives, with specific focus on sectoral groups like women, aged, children and ethnic minorities;
5. Training inputs in accordance with the objectives of the project and the needs of the community for training;
6. Wide stakeholder’s involvement and participation. Effective networking and knowledge capitalization;
7. Accumulation of physical, technological and economic assets to reduce hazards and vulnerability; and
8. Legislation and incorporation of CBDM in development planning and budgeting.

Proposal 7:

Utilize the best available predictive and preventive systems and technology for disaster mitigation that are appropriate and cost-effective to local conditions which are well adapted to community needs.

It is important to introduce cost-effective predictive and preventive systems and technology that are suited to local circumstances and community needs. Before investing a large amount of money for costly system, alternative measures based on the traditional knowledge of the community should be considered. When introducing a new system or technology, the life-cycle cost including the initial and maintenance costs should be strictly examined.

Proposal 8:

Stress the importance of the power of each individual to make a difference in disaster reduction.

Disasters are simply a fact of life for most of the world's population. Human activity adversely affects the physical environment, altering landscapes and modifying climates. Rapid population growth and the explosion of urban areas only increase people's exposure to hazard. So learning to live with hazards and coming to expect disasters is necessarily part of the daily routine of people's lives.

Effective leadership at the grassroots level can make a crucial difference to a community's well-being and security. Guidance, however, is often not provided through the visible structures of local government but through alternative means of articulating power and influencing people that is no less real and frequently more effective than that exercised by more formal agencies.

Communities require direction to help them realize the potential of their inherent social capital, and community leaders require support to make their guidance more effective. Rather than ignoring them or seeing them as obstacles to development, the challenge for effective disaster reduction is to provide these men and women with adequate resources, hold them accountable for their actions and synchronize their form of leadership more fully with other levels of governance.

Promote research and outreach:

Proposal 9:

Promote advanced international collaborative researches on mechanisms & impacts of natural disasters, and on countermeasures, recoveries, and reconstruction plans.

To formulate an effective disaster reduction policy, it is essential to introduce up-to-date results of the scientific research on mechanisms, impact, countermeasures, and recovery and reconstruction plans regarding natural hazards.

Natural scientists are responsible for the mechanisms and prediction of the natural hazards. Engineers are generally responsible for analyzing the impacts of hazards to human and engineered structures. They are also responsible for developing new measures against natural hazards utilizing most recent structural and non-structural information. Social scientists should play important roles when making recovery and reconstruction strategies from natural disasters.

When experienced scientists and engineers are not available in the affected countries, it is necessary to promote international collaborative research. This will greatly contribute to solve problems encountered in during the earlier stage after the disaster and to assist scientists and engineers in the affected countries manage in the following phases.

Proposal 10:

Encourage outreach through education, training and the media and ensure that it is made a central feature of all scientific, technological and management practices and research outputs.

To prepare for and to respond quickly to infrequent natural disasters, it is important to keep awareness of local residents regarding to the risk of disasters. Efforts for keeping awareness should be made in various ways. Education, especially in schools, is a quite effective knowledge conveyor. Recent studies suggest that many of school pupils talk to their family on what they have learned at school about disaster risk and countermeasures. This helps dissemination of up-to-date knowledge on disasters. In addition, they will teach their children when they grow up, conveying knowledge on disaster management over generations.

Education and training for local communities and local governments should be strongly promoted. At the time of disasters, self-help and mutual-help policies are keys to save the lives of affected people. We have learned this lesson from many tragedies such as the 1995 Kobe Earthquake.

Mass media also play important roles for educating people to have correct and up-to-date knowledge about disaster management. Appropriate policies for news editing and good educational program on natural disasters will drive people's awareness and preparedness for disasters in correct direction. To this end, researchers and engineers should frequently communicate with journalists to transmit correct and up-to-date information. Good educational programs should be shared among countries which suffer from natural disasters.

On the 2004 Giant earthquake and tsunami:

In addition to proposals 1 – 10, the following two proposals are made based on the disaster from the 2004 Sumatra earthquake and tsunami. Numerous efforts have been done for recovery and reconstruction since the disaster. Scientific research on the mechanism and impact of the relevant phenomena and construction of effective tsunami warning system in the Indian Ocean should be strongly promoted through international collaboration.

Proposal 11:

Promote research and international collaboration to understand the mechanism and to forecast the future events similar to the 2004 giant earthquake and tsunami.

Very few scientists, if any, anticipated such a big earthquake (M 9.3) would occur in the Indian Ocean. Earthquakes of this size occurred only four times in the world in the 20th century, and instrumental data and scientific knowledge of such a rare event is limited. Nevertheless, during the 50 years after the 1960 Chilean earthquake which caused the Pacific-wide tsunami, our knowledge about earthquakes and tsunamis has dramatically increased.

Prior to the 2004 Sumatra Earthquake, geological studies on Sumatra Islands indicated that large earthquakes had recurred every few hundred years, and long-term forecast of large (M~9) earthquake was also made in scientific community. When the earthquake

occurred, its size and focal mechanism were immediately estimated and the generation of tsunami and its arrival were forecasted by the Pacific Tsunami Warning Center in Hawaii. If such information had been shared among countries surrounding Indian Ocean by public transmission system, effects of the 2004 tsunami disaster would have been much smaller in some of the countries.

International collaboration is essential to document, monitor and forecast such rare but catastrophic hazards. We first need to document what happened around the Indian Ocean in December 2004 and what is still taking place. To document the tsunami's physical size and damage, many scientists from all over the world visited the affected coasts. Because the affected area covers many countries including Indonesia, Thailand, Malaysia, Myanmar, India, Sri Lanka, Maldives and some African countries, international coordination was needed to collect various tsunami data. However, without high-quality data, no scientific progress is expected.

It is extremely important to share information and data among interested scientists. We understand that some kinds of geophysical data are sensitive for national defense and their free exchange is limited by governments' policies. They should, however, recognize merits of disseminating them for scientific progress which would lead to hazard reduction and saving many human lives in future disasters.

Forecasting natural hazards is a difficult task to realize. It would be materialized through retrospective studies in the past as well as studying recent cases in our own age. However, documents of historical disasters are limited because of long recurrence interval of gigantic events. Global examinations of similar disasters would help us understand the nature of disasters, which provide us with more abundant case studies. International collaborations are thus truly important for this purpose. Lessons from one country should be used for the preparedness of other countries.

Proposal 12:

Develop cost-effective tsunami warning system in the Indian Ocean through international collaboration and using existing capacities.

One of reasons why the 2004 Sumatra earthquake and tsunami caused such great casualties of more than 200,000 around the Indian Ocean is the lack of tsunami information and warning system to inform the coastal residents the terror of the

tsunami just after the earthquake generation. Since the propagation speed of the seismic wave is 10 times faster than that of the tsunami, it was technically possible to estimate the magnitude and arrival time of the tsunami after observing the seismic waves and estimating the magnitude and epicenter of the earthquake before the tsunami attacked the coastal areas of some affected countries.

The tsunami warning systems in Japan and the United States started more than 50 years ago. They issue tsunami warnings based on the relationship between earthquakes and tsunamis. The international warning in Pacific ocean started after the attack of the 1960 Chilean Tsunami that affected all coastal area in the Pacific. It is time for Indian ocean countries to establish national tsunami warning centers as well as the regional international centers to exchange information and to initiate the public awareness. Scientific and technological assistance from the existing systems such as PTWC (Pacific Tsunami Warning Center) and ITIC (International Tsunami Information Center) is essential.

There are three steps for design and establishment of a warning system. The first is to estimate the possibility of a tsunami generation according to the magnitude, location and depth of an earthquake, based on the statistical relationship. Expansion of existing international seismograph network with digital recording and data telemetry and construction of similar national network would make it possible for real-time estimate of earthquake source parameters. International exchange of seismographic data is essential.

The second is the construction of database which can provide the quantitative information of the arrival time and the wave heights of a tsunami. Such information can be obtained by numerical simulation for several potential tsunami sources and can be stored in the computer system. JMA (Japan Meteorological Agency) already started such a system and can issue the tsunami warning within 3 minutes after a causative earthquake. However discrepancies between forecasted and observed tsunami parameters would affect the reliability of warning system and sometimes become fatal. The system to revise the preliminary forecast by the real time analysis is necessary.

The third is to include the tsunami observation data to estimate an initial location and displacement of the sea surface from inverse analysis. The real time observation offshore is desirable to detect a tsunami much earlier than the coastal arrival. Operation and design of offshore observation systems using DART and GPS sensor

buoys should be studied in terms of accuracy, time and cost effectiveness.

Finally and most importantly, the tsunami information should reach to the coastal people properly and reliably for response and evacuation. Dissemination of the tsunami warning through different types of media such as TV, radio, loudspeaker, phones, etc., considering cost-effectiveness in each country and region is also important. What kinds of information are needed and when it should be transmitted to the public are difficult questions to answer and discussions are still being made. Interdisciplinary studies covering information technology, psychology, recognition science, emergency management and public education are required to establish cost-effective and robust tsunami warning system which can be continuously operated for a long time.

Appendix A: List of contributors

Teruyuki Kato	Earthquake Research Institute, Univ. of Tokyo, Japan
Koshun Yamaoka	Earthquake Research Institute, Univ. of Tokyo, Japan
Fumihiko Imamura	Disaster Control Research Center, Tohoku Univ., Japan
Greg Bankoff	University of Auckland, New Zealand / Coventry Univ., U.S.
Masayuki Watanabe	Institute for International Development, Disaster Prevention and Peace Inc., Japan
Kenji Okazaki	National Graduate Institute for Policy Studies, Japan
Haruo Hayashi	Disaster Prevention Research Institute, Kyoto Univ., Japan
Yuichi Ono	United Nations International Strategy for Disaster Reduction
Koji Sekiguchi	National Research Institute for Earth Science and Disaster Prevention, Japan
Eisuke Fujita	National Research Institute for Earth Science and Disaster Prevention, Japan

Appendix B: Report of symposium

The conference for developing this recommendation was held in December, 2005.

Memorial Conference on the 2004 Giant Earthquake and Tsunami
in the Indian Ocean
[Part 2]

International Symposium on Proposals toward
International Collaboration for Disaster Reduction

Period: December 16-17, 2005

Venue: Dec. 16: at Zenkyoren Bldg., 2-7-9 Hirakawa-cho, Chiyoda, Tokyo
Dec. 17: at Akasaka Prince Hotel, 1 - 2 Kioi-cho, Chiyoda, Tokyo

Sponsors: National Research Institute for Earth Science and Disaster Prevention,
Disaster Prevention Research Forum

Co-sponsors: ERI Univ. of Tokyo , DPRI Kyoto Univ., National Institute of Advanced
Industrial Science and Technology, Science Council of Japan ,Science Council of
Asia , Japan Society for the Promotion of Science, JAMSTEC, JAXA, UNESCO,
ISDR, UNCRD

This symposium is based on the agreement at the United Nations World Conference on Disaster Reduction, in which the necessity of international collaboration for restoration from the 2004 Giant Earthquake and Tsunami in the Indian Ocean was addressed. The symposium is organized as a Joint program of the Science Council of Asia. The symposium will make proposals for disaster reduction framework through holistic international collaboration among Asian countries.

The participants were from Indonesia, Thailand, Malaysia, Bangladesh, India, New Zealand and Japan, who are the member of universities, national institutes, national organizations, and NGOs. The presentations are categorized into three parts.

Session1: Disaster report and Needs of the Affected Countries

Session 2: Proposals for disaster reduction framework in view of Science & Technology.

Session 3: Lessons from Disaster Fields and Needs for Higher Disaster Coping Capacity.

At the last part of the symposium, we had a panel discussion entitled “For Sustainable Development in Affected Countries – Needs in Research Works and Practices” and made proposals as listed in the executive summary in this report.

Symposium Program

- (MRI), Masajiro Imoto (NIED) and Sin-Iti Iwasaki (NIED)
- 15:30-15:50 [P2-2-2] Education and promotion for increasing disaster preparedness
Koshun Yamaoka (ERI, Univ. of Tokyo) , Hirotsune Kimura (Nagoya Univ.) and Tetsushi Kurita (ADRC)
- 15:50-16:10 [P2-2-3] Effective Tsunami Warning System and Mitigation
Fumihiko Imamura (Tohoku Univ.), Shinya Tsukada (JMA), Kenji Hirata (JAMSTEC), Norihiko Nagai (PARI)
- 16:10-16:30 [P2-2-4] Vulnerability of Infrastructures against the Sumatra Earthquake and Tsunami and their Restoration Program
Hirokazu Iemura (Kyoto Univ.)
- 16:30-16:50 General Discussion

Dec. 17 (Sat.)

Session 3: Lessons from Disaster Fields and Needs for Higher Disaster Coping Capacity

- 9:00- 9:30 [P2-3-1] Not Child's Play: Taking Another Look at Vulnerability in the Light of the Indian Ocean Tsunami and Hurricane Katrina
Greg Bankoff (Univ. of Auckland, New Zealand)
- 9:30-10:00 [P2-3-2] Motivation and Capacity Building for Disaster Reduction
Kenji Okazaki (GRIPS)
- 10:00-10:30 [P2-3-3] Matching Goods and People: Emergency Assistance Under Uncertainty
Jin Sato (Univ. of Tokyo)
- 10:30-11:00 [P2-3-4] Recovery of Aceh Post-Tsunami: Lesson Learnt and Challenges
Saifuddin Bantasyam (Aceh Recovery Forum, Indonesia)
- 11:00-11:30 [P2-3-5] Community based to disaster prevention and management
Ravadee Prasertcharoensuk (Sustainable Development Foundation, Thailand)
- 11:30-12:00 [P2-3-6] Potential For Incorporating Coping Capacities In Community Based Disaster Management
Manu Gupta and Anshu Sharma (SEEDS, India)

(lunch time: 12:00-13:15)

- 13:15-13:45 [P2-3-7] Empowerment of Coastal Community in Risk Reduction - Bangladesh Experience

14:15-14:45	B.M.M. Mozaharul Huq (Bangladesh Disaster Preparedness Centre) [P2-3-8] Strategy for disaster prevention and reduction Haruo Hayashi (DPRI, Kyoto Univ.)
14:45-15:15	[P2-3-9] How to strengthen Disaster Coping Capacity of a community and a State Masayuki Watanabe (Inst. for International Development, Disaster Prevention and Peace Inc.)
15:15-15:40	Discussion

(coffee break: 15:40-16:00)

Session 4: For Sustainable Development in Affected Countries – Needs in Research Works and Practices (Panel Discussion)

16:00-16:45	Co-chair: Tsuneo Katayama (NIED, Japan) Greg Bankoff (Univ. of Auckland) Panelists: Haruo Hayashi (Kyoto, U., Japan), Kenji Satake (AIST, Japan), Ir.H. Sarwidi (The Islamic Univ. of Indonesia), Jostacio Lapitan(WHO, WKC) Yuuichi ONO(UN, ISDR)
16:45-16:55	Proposals from the symposium Tsuneo Katayama (NIED, Japan)
16:55-17:00	Closing address
17:00	Adjournment of the Symposium

Appendix C: SCA Joint Projects

One of the activities of Science Council of Asia (SCA) is to develop Joint Projects to foster networking among the scientists of member countries and research collaboration on sustainable development and improvement in the quality of life in Asia. The SCA Joint Projects are designed to pool Asia's scientific knowledge and offer scientists the advantage of project endorsement by SCA member countries.

At the first SCA conference in 2001, the projects proposed by Malaysia and Thailand were designed SCA Joint Projects, and two nations were assigned as leaders of their respective projects. At the fifth SCA conference, three projects on gender, hydrology and natural hazards were authorized as the SCA Joint Projects. So far, 17 projects were proposed by member countries for consideration for the SCA Joint Project.

Projects Recognized at the First SCA Conference in 2001

Sustainability Science

Tan Sri Dato' Dr. Omar Abdul Rhaman (Academy of Science Malaysia)

Sustainability Development Indicators

Prof. Dr. Montri Chulavatnatol (Thai Academy of Science and Technology)

Projects Authorized at the fifth SCA conference in 2005

A comparative Study of the Research Conditions of Women Scientists and the Present States of Women's/Gender Studies in Asian Countries Towards the Sustainable Development

Ms. Sjamsiah Achmand (Indonesian Institute of Sciences), Dr. Hiroko Hara (Science Council of Japan)

Management of Sustainable Aquatic Environment

Dr. Tetsuya Kusuda, Dr. Tadashi Yamada, Dr. Kazuo Nadaoka (Science Council of Japan)

Recommendation for International Collaboration on Natural Hazard Reduction

Dr. Tsuneo Katayama (National Research Institute for Earth Science and Disaster Prevention) and Dr. Kenji Satake (Geological Survey of Japan, National Institute of Advanced Industrial Science and Technology)

Proposed Projects

At the second SCA conference in 2002

Establishment of Information Networks for Publicizing the Importance and Utilities of Science and Technology in Asia

Dr. Hitoshi Ohtaki (Science Council of Japan)

Asian Harmonization of Advanced Medicine through Established of Asia CORD

Dr. Shigetaka Asano (Science Council of Japan)

GaiaList21: Toward the Comprehensive Description and Conservation of Biodiversity

Dr. Motonori Hoshi (Science Council of Japan)

Collaborative Research in the Field of Hydrology

Dr. Tadashi Yamada (Science Council of Japan)

The Paradox of Technology in Sustainable Development

Dr. Sung Chick Hong (National Academy of Sciences, ROK)

CO2 Accounting in Singapore

Prof. Leo W.H. Tan (National Institute of Education, Singapore)

The Integration of Clean Production /Technologies into the Overall Performance of Firms, with Focus on Increasing Competitiveness of Small and Medium-scale Enterprises: A Comparative Study of Asian Economies

Dr. Tran Noic Ca (Ministry of Science and Technology, Vietnam)

From Crisis to Sustainable- Science for Sustainable Development in Indonesia

Dr. Jan Sopaheluwakan (Indonesian Institute of Science)

At the third SCA conference in 2003

Institution and Capacity Building for Sustainable Rural Development Agenda for the Coming Decade

Dr. Sudarshan Iyengar, Dr. Ranjit Sinha (Indian Council of Social Science Research)

Comparative Study on Gender Perspective in Science and Technology Policy

Ms. Sjamsiah Achmand, Ms. Achie Sudiarti Luhulima, Ms. Wati Hermawati (Indonesian Institute of Science)

Muller Expedition: Feasibility Study of Proposing Muller Mountains as a Natural World Heritage

Dr. Endang Sukara (Indonesian Institute of Science)

A comparative Study of the Research Conditions of Women Scientists and the Present States of Women's/Gender Studies in Asian Countries Towards the Sustainable Development

Dr. Hiroko Hara (Science Council of Japan)

International Cooperation for Safety of Maritime Navigation in Asia

Dr. Tadao Kuribayashi (Science Council of Japan)

Assessment of Climate Changes and Estimation of Their Impact on Crop Production in Asia

Dr. Ryuichi Ishii (Science Council of Japan)

The Role of Asian Countries in the Development of a New Generation of Vaccines

Dr. Sang Dai Park, Dr. Ho Wang Lee (National Academy of Sciences, ROK)

At the Fifth SCA conference in 2005

Coastal Ecosystems Response to Climate Change and Human Impact in the Asia-Pacific Region (CRECCHI Project)

Prof. Dr. Ibrahim Komoo (Institute for Environment and Development, Malaysia)

Guidelines for SCA Joint Projects

1. Concept

SCA Joint Projects are research projects on scientific issues promoted by two or more researchers under the leadership of a research of member country. The objective of the projects should be i. to share experiences, ii. to promote collaboration and iii. to achieve the common goals of the SCA.

2. New Proposals

- (1) Any person recommended by a member organization of the SCA is eligible to propose a SCA Joint Project as an anchor.
- (2) The anchors of the proposed SCA Joint Project shall have an opportunity to present interim or final results of the project at the annual SCA conference.

3. Collaboration

- (1) Any person who is interested in the proposed project may apply for collaboration to the anchor. The collaborators may not necessarily belong to member organizations.
- (2) When the proposed project gets an offer of collaboration, the anchor shall start the project with the collaborators except for cases of specific obstacles.
- (3) The member organization that recommend the anchor shall offer as much assistance as possible to him/her in order to promote the project.

4. Authorization

- (1) The proposed project may be authorized as SCA Joint Projects at the SCA management Board Meeting when it is agreed that it meets the objectives of the SCA.
- (2) The SCA and its member organizations shall disseminate the interim and final results of SCA Joint Projects to government, public, national academic organizations and industries as well as international academic organizations.

5. Note

The SCA shall not give any financial assistance to any SCA Joint Projects until necessary conditions are met including establishment of own financial resources by introduction of membership fee.

Appendix D: Science Council of Asia

Short History

The Science Council of Japan hosted the Asian Conference on Scientific Cooperation (ACSC) in Tokyo a total of eight times from 1993 to 2000 with the aim of promoting cooperation in scientific research among Asian countries. Invited to the conference were leading scientists from Japan, China, India, Indonesia, the Republic of Korea, Malaysia, the Philippines, Singapore, Thailand, and Viet Nam. As scientists from these ten countries developed trust through their participation in the ACSC, they came to recognize the necessity of transforming the ACSC into a permanent and independent entity to pool the wisdom of the scientists from this region and communicate the results of their research to the rest of the world. Such a framework would help the region more actively address the diverse and urgent science-related issues common to Asian countries, including population problems, medical care, food, water, energy, and knowledge of and education in the sciences.

The ACSC completed its mission at its eighth meeting held in May 2000, when representatives from the ten countries established a new scientific organization named the Science Council of Asia (SCA). The first SCA conference was held in Bangkok, Thailand, in May 2001.

The annual SCA conference is held on a rotational basis so that each member country can actively participate in and contribute to the SCA. The annual conference consists of a General Assembly, a Management Board Meeting, and a Symposium which provides for discussions among scientists, engineers, policymakers, and students from Asia.

SCA Presidents

May 2000 - May 2001 Prof. Dr. Montri Chulavatnatol
Vice President, Thai Academy of Science and Technology

May 2001 - May 2002 Tan Sri Datuk Dr. Omar Abdul Rahman
Past President, Academy of Sciences of Malaysia

May 2002 - May 2003 Dr. Ir. S. Suparka

Vice Chairman, Indonesian Institute of Sciences

May 2003 - May 2004 Dr. Ho Wang Lee

President, National Academy of Sciences, Republic of Korea

May 2004 - May 2005 Mr. Thach Can

Director General, International Cooperation Department, Ministry of Science and Technology, Vietnam

May 2005 - April 2006 Prof. Andre Beteille

Chairman, Indian Council of Social Science Research

Organizational Structure

The SCA is composed of eligible organizations from member countries. A maximum of three organizations per country may be admitted. The SCA does not collect membership fees from member countries at present.

The SCA is governed by the Management Board which consists of one designated representative from each member country. The SCA Secretariat is housed at the Science Council of Japan. The General Assembly and Management Board Meeting are each held once a year.

Officers

President

Dr. Andre Beteille

Chairman, Indian Council of Social Science Research (ICSSR)

Specialty: Sociology

Vice President and Secretary General/Treasurer

Dr. Kiyoshi Kurokawa

President, Science Council of Japan (SCJ)

Specialities: Clinical medicine and metabolic disorders

Immediate Past President

Mr. Thach Can

Director General, International Cooperation Department, Ministry of Social and Technology (MOST), Viet Nam

Specialties: Geology and mining; S&T in industry development; development of S&T international cooperation; project formation, implementation and appraised evaluation

Activities

First Conference

May 9 - 11, 2001 Bangkok, Thailand

Theme: "Urgent Agenda for Asian Sustainability through Science and Technology"

Hosted by: National Research Council of Thailand (NRCT) and Science Council of Japan (SCJ)

In cooperation with: Thai Academy of Science and Technology (TAST) and Science Society of Thailand (SST)

Second Conference

May 13 - 15, 2002 Kuala Lumpur, Malaysia

Theme: "Urgent Agenda for Asian Sustainability: Operationalising the Vision"

Organized by: Academy of Sciences Malaysia (ASM) and Science Council of Japan (SCJ)

In cooperation with: Ministry of Science, Technology and the Environment, Malaysia (MOSTE) and Institute for Environment and Development, Universiti Kebangsaan Malaysia (LESTARI)

Third Conference

May 13 - 15, 2003 Denpasar, Bali, Indonesia

Theme: "Operationalising the Vision: Optimal Resource Utilization for Sustainable Development"

Organized by: Indonesian Institute for Sciences (LIPI)

Co-organized by: Directorate General for Higher Education, Ministry of National Education, Indonesia and Science Council of Japan (SCJ)

Fourth Conference

May 13 - 15, 2004 Seoul, Republic of Korea

Theme: "Globalization of Asian Economy and Role of Science for Sustainable

Development”

Organized by: The National Academy of Sciences (NAS), Republic of Korea

Co-organized by: Science Council of Japan (SCJ)

Supported by: Ministry of Education and Human Resources Development (MOE) and Ministry of Science and Technology (MOST), Republic of Korea

Fifth Conference

May 11 - 13, 2005 Hanoi, Vietnam

Theme: “Bioscience and Biotechnology for Sustainable Development: Future of Asian Economy”

Organized by: Ministry of Science and Technology (MOST), Vietnam

Co-organized by: Science Council of Japan (SCJ)

Supported by: Ministry of Health, Vietnam (MOH), Vietnam Academy of Science and Technology, and National Council for Scientific and Technological Policy, Vietnam

Sixth Conference

April 17-19, 2006 New Delhi, India

Theme: “Institution and Capacity Building for Rural Development and Role of Sciences for Sustainable Development”

Organized by “Indian Council of Social Sciences Research (ICSSR)

Co-organized by: Science Council of Japan (SCJ)

Seventh Conference

2007 Japan

Eighth Conference

2008 China

Ninth Conference

2009 Singapore

Tenth Conference

2010 The Philippines

Member Organizations

CHINA

China Association for Science and Technology (CAST)

3 Fuxing Road, Beijing 100863, China

Tel: +86-10-68578283

Fax: +86-10-68571897

URL: <http://www.cast.org.cn>

INDIA

Indian Council of Social Science Research (ICSSR)

Aruna Asaf Ali Marg, New Delhi 110067, India

Tel: +91-11-26192059

Fax: +91-11-26182109

URL: <http://www.icssr.org>

INDONESIA

Indonesian Institute of Sciences (LIPI)

Sasana Widya Sarwono, Jl. Jenderal Gatot Subroto No. 10, Jakarta12710, Indonesia

Tel: +62-21-5255179

Fax: +62-21-555179

URL: <http://www.lipi.go.id>

Ministry of National Education

(Directorate General of Higher Education)

Jalan Jenderal Sudirman, Pintul, Senayan, Jakarta10002, Indonesia

Tel: +62-21-573-1436

Fax: +62-21-573-1466

URL: <http://www.pdk.go.id>

JAPAN

Science Council of Japan (SCJ)

7-22-34 Roppongi, Minato-ku, Tokyo 106-8555, Japan

Tel: +81-3-3403-1949

Fax: +81-3-3403-1755

URL: <http://www.scj.go.jp>

E-mail: sca@scj.go.jp

REPUBLIC OF KOREA

National Academy of Sciences (NAS), Republic of Korea
San 94-4, Banpo 4-dong, Seocho-gu, Seoul 137-044, Republic of Korea
Tel: +82-2-534-0737
Fax: +82-2-537-3183
URL: <http://www.nas.go.kr>

Korean Academy of Science and Technology (KAST)
7-1, Gumi-dong, Bundang-gu, Seongnam, Gyeonggi-do 463-808, Republic of Korea
Tel: +82-31-710-4611
Fax: +82-2-566-3264
URL: <http://www.kast.or.kr>

MALAYSIA

Academy of Sciences Malaysia (ASM)
902-4 Jalan Tun Ismail, 50480 Kuala Lumpur, Malaysia
Tel: +603-2694-9898
Fax: +603-2694-5858
URL: <http://www.akademisains.gov.my>

Ministry of Science, Technology and Innovation (MOSTI)
Aras 1-7, Block C5, Pusat Pentadbiran Kerajaan Persekutuan 62662 Putrajaya,
Malaysia
Tel: +603-8885-8000
Fax: +603-8889-2996
URL: <http://www.mosti.gov.my>

Institute for Environment and Development (LESTARI)

Universiti Kebangsaan Malaysia, 43600 UKM Bangi, Selangor, Darul Ehsan, Malaysia
Tel: +603-8921-4144/8926-1241
Fax: 603-8925-5104
URL: <http://www.lestari.ukm.my/webBI/depanBI.html>

MONGOLIA

Mongolian Academy of Sciences (MAS)

Prime Minister A. Amar Street 1, Ulaanbaatar 210620A, Mongolia

Tel: +976-11-261638

Fax: +976-11-261638

URL: <http://www.mas.ac.mn>

THE PHILIPPINES

National Research Council of the Philippines (NRCP)

Patrocinio Valenzuela Hall, Gen. Santos Ave., Bicutan, Taguig, Metro Manila, The Philippines

Tel: +632-837-6142

Fax: +632-837-6143

URL: <http://mis.dost.gov.ph/nrcp>

Philippine Social Science Council (PSSC)

Philippine Social Science Center, Commonwealth Ave. 1101 Diliman, Quezon City, Philippines

Tel: +632-922-9621

Fax: +632-924-4178/929-2671

URL: <http://www.pssc.org.ph>

Philippine Association of Marine Science (PAMS)

c/o Marine Science Institute, University of the Philippines, 1101 Diliman, Quezon City, Philippines

Tel: +63-2-9223958

Fax: +63-2-9247678

URL: <http://www.geocities.com/pams7msun/>

SINGAPORE

Agency for Science, Technology and Research (A*STAR)

20 Biopolis Way #07-01 Centros, Singapore 138668, Singapore

Tel: +65-6826 6111

Fax: +65-6777 1711

URL: <http://www.a-star.edu.sg/astar>

THAILAND

Thai Academy of Science and Technology (TAST)

Gypsum Metropolitan Building, 18th Floor, 539/2 Sri Ayuthaya Road, Bangkok 10400,
Thailand

Tel: +662-644-8022

Fax: +662-248-7549

URL: <http://www.tast.or.th>

Science Society of Thailand under the Patronage of His Majesty the King (SST)

c/o Faculty of Science, Chulalongkorn University

254 Phayathai Road, Patumwan, Bangkok 10330, Thailand

Tel: +662-252-7987

Fax: +662-252-7987

URL: <http://www.scisoc.or.th>

VIETNAM

Ministry of Science and Technology (MOST)

39 Tran Hung Dao Str, Ha Noi, Viet Nam

Tel: +84-4-822-8751

Fax: +84-4-943-9987

URL: <http://www.most.gov.vn>

Ministry of Health (MOH)

Science and Training Department, 138A Giang Vo Str., Ha Noi, Viet Nam

Tel: +84-4-846-4918

Fax: +84-4-843-0015

URL: <http://www.moh.gov.vn>