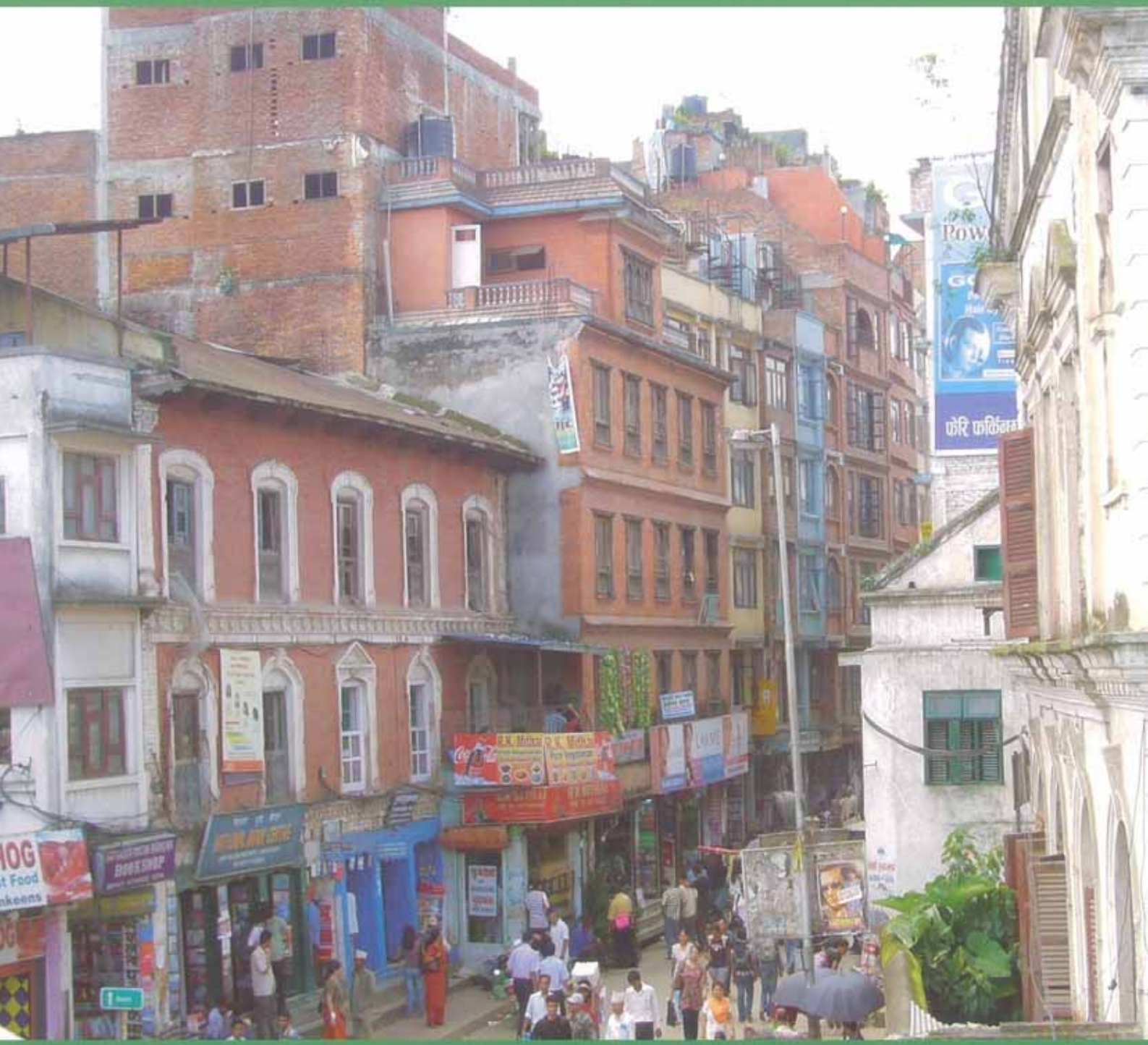
International Disaster Management Symposium 2007

Culture of Disaster Prevention in the Context of Housing and Urbanization

Proceedings



UNCRD
United Nations Centre for Regional Development
Disaster Management Planning Hyogo Office

International Disaster Management Symposium 2007

Culture of Disaster Management in the Context of Housing and Urbanization

Proceedings

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Kobe, Japan

United Nations Centre for Regional Development
Disaster Management Planning Hyogo Office

in collaboration with

Yomiuri Shimbun Osaka
International Disaster Management Symposium Steering Committee
Hyogo Prefecture, Kobe City
The Great Hanshin-Awaji Earthquake Memorial 21st Century Research Institute
International Recovery Platform, Citizens towards Overseas Disaster Emergency
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Preface

Twelve years ago, the Great Hanshin-Awaji Earthquake of magnitude 7.3 struck off the coast of Kobe, Japan. The event claimed more than 6,000 lives and left over 43,000 people injured. It caused severe damage to residential buildings, health, education and other critical facilities. Total economic damage amounted to $100 million, by far the largest scale from a single disaster in the world.

Thanks to recovery and reconstruction efforts made by individuals, communities and governments, the city of Kobe has recovered successfully. However, the need for disaster preparedness remains today. One effective means is to improve earthquake resistance of vulnerable houses. Close to 90 percent of deaths caused by the earthquake disaster owed to the collapse of houses, making clear the importance of structural safety of houses and buildings.

United Nations Centre for Regional Development (UNCRD) has been active in the area of disaster management through training and capacity building of government officials and communities. It has implemented numerous projects to reduce disaster risk in disaster prone countries across the world. Currently, UNCRD implements three projects: Community-Based Disaster Management (CBDM), School Earthquake Safety Initiative (SESI) and Housing Earthquake Safety Initiative (HESI), through Disaster Management Planning Hyogo Office.

International Disaster Management Symposium has been held in Kobe every year since 2002 to raise public awareness on disaster prevention. The event has dealt with various themes. The objective of this year's symposium was to identify strategies to create a "culture of disaster prevention" in the context of housing and urbanization. Raising public awareness was an important aspect because individual house owners have a major role to play in making houses safe. UNCRD hopes that this publication contributes to raise awareness on the importance of improving the safety of houses for future disaster risk reduction.

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Welcome address

Kazunobu Onogawa
Director, United Nations Centre for
Regional Development

It is a pleasure to welcome everyone to this symposium. It is also a great privilege to welcome Mr. Saito, the Vice-Governor of Hyogo Prefecture, and Mr. Oikawa, the President of Yomiuri Shimbun Osaka. Thanks to generous support of Hyogo Prefecture and Yomiuri Shimbun, this year's symposium is the 6th since its inception and is becoming an annual event. I would like to express my gratitude for the continuous support we receive for the event.

This year denotes the 50th anniversary of Japan's membership in the United Nations. Also, last year was the 35th anniversary of the establishment of UNCRD. I am grateful for the generous support that has enabled us to hold a series of events such as today's symposium throughout the organization's history.

UNCRD Headquarters was founded in Nagoya in 1971. We have addressed various development themes, and disaster management has always been a major field of our work. Following the Great Hanshin-Awaji Earthquake, the disaster management branch was detached from UNCRD Headquarters and was relocated in Hyogo with the support of the prefectural government. For eight years since then, UNCRD Hyogo Office has been actively implementing disaster management projects around the world. In doing so, we have made attempts to equip project countries to implement disaster management projects on their own. We have attempted to engage stakeholders in the target countries and communities in project implementation. This practice was named "Community Based Disaster Management". Through this approach, the work of UNCRD Hyogo Office has been gaining recognition worldwide.

Besides the Community Based Disaster Management, UNCRD has been promoting disaster prevention in another project by retrofitting vulnerable school buildings and encouraging disaster education. But we have realized that disaster prevention needs to encompass not only technology transfer and implementation of projects in schools and communities but also increasing awareness of the need for disaster prevention among wider population. How, then, can we translate increased awareness into concrete actions? It might be difficult to advance disaster management without integrating it into our daily lives.

That understanding is precisely the ground for holding this international symposium on "Culture of Disaster Prevention in the Context of Housing and Urbanization". The event introduces case studies from different counties with the aim to develop shared understanding among participants on the need to create a culture of disaster prevention. A three-day expert meeting on housing earthquake safety started yesterday in relation to this event, involving participants from India, Indonesia, Nepal, Peru and Japan. Some of the experts are present at this event and will make presentations on disaster prevention initiatives in their respective countries. We trust that their presentations will enrich our learning experience in the symposium.

As I mentioned, this symposium is the 6th since it started. We hope that the audience will not simply end up listening to presentations but also engage in fruitful discussions with presenters.

We have secured some time for discussions and we would strongly value your contribution. Thank you very much.

Welcome address

Tomiyoshi Saito
Vice-Governor, Hyogo Prefecture

Good afternoon ladies and gentlemen. I would like to welcome all of you to this symposium. I have been given only 5 minutes, which is too short to fully express my feelings. Nevertheless, I will try to make my speech within the given time so that the event can be executed smoothly. It was the 17th of January. My heart aches around this time of year recalling that day. Kobe City has recovered, but I feel that hearts and minds of those who suffered have not recovered completely. A total of 6,434 lives were lost instantaneously, but we gained valuable lessons from that experience. We must think how to make use of the lessons learnt not only among ourselves but also among people from across the world so that we can develop disaster resilient communities, towns and cities globally.

I am grateful for the continued initiative by UNCRD and Yomiuri Shimbun to hold the international disaster symposium every year. I highly regard their efforts to diffuse lessons derived from the Great Hanshin-Awaji Earthquake through collaboration between a national newspaper publisher Yomiuri Shimbun and a United Nations organization. I hope that this program will continue.

One of the lessons is the importance of preparedness. We experienced the earthquake completely unprepared. Having a system of disaster prevention is not enough to protect people's lives. But we learned that we can prevent human casualties by improving seismic safety of houses and building earthquake-resilient communities. Statistics shows that 87.9 percent of the deaths owed to the collapse of houses. Even the establishment of disaster prevention facilities, in the form of a disaster prevention center, for instance, does not directly save human lives. But lives can definitely be saved by preventing the collapse of residential buildings. Therefore, the prefectural government has taken an initiative to encourage people to reinforce their houses for the past 12 years. Unfortunately, people's awareness on the need for disaster preparedness has been fading with time. I believe that this change requires rethinking.

The same can be said for recovery. The priority is the recovery of victims, destroyed houses and communities. For 12 years, we have advocated that the individual capacity of victims is not sufficient for the reconstruction of destroyed houses and that complete recovery requires public assistance. As a result, we have gained a financial support scheme of two million yen per house. But, a new house cannot be built with just two million yen. It requires tens of millions of yen. Hence, to facilitate housing and community recovery, Hyogo Prefecture established "Hyogo Mutual Aid Fund for Housing Reconstruction" as Japan's first housing insurance against natural disaster risks. Under the scheme, for example, the owner of a completely destroyed house can receive up to six million yen. The system aims to assist people in reconstructing their homes by distributing the fund maintained by small individual contributions. Unfortunately, subscription rate is below six percent whereas the target is 15 percent. There are only 100,000 houses in coverage.

Meanwhile, we have to continue to appeal to the public with the goal of diffusing a culture of disaster prevention and avoiding the recurrence of the same disaster. For that reason, I have high expectations for today's symposium. I hope that the outcome of this event will be shared not only among participants but across the country through Yomiuri Shimbun articles. I also trust that disaster management programs will continue to thrive through Yomiuri Shimbun and UNCRD.

Opening remarks

Shoichi Oikawa
President, Yomiuri Shimbun Osaka

Good afternoon, ladies and gentlemen. My name is Shoichi Oikawa. It is a great pleasure to see so many participants to this event. And I would like to thank those experts who came from distant countries like India, Indonesia, Nepal and Peru.

It has been 12 years since the Great Hanshin-Awaji Earthquake occurred, killing 6,434 people. The city of Kobe has recovered successfully but I believe that sadness and a sense of powerlessness felt by victims have not faded. Meanwhile, children who were born in the year of the disaster will become 12 years old this year. Generations with no disaster experience will continue to increase. That is why we must pass our experiences and lessons learned from the earthquake on to future generations.

Passing of experiences sheds light on the critical role of the press. In this respect, Yomiuri Shimbun has been active in providing various series and special reports beyond the front and social sections of its newspaper on and around January 17th every year. In recent years, we have focused on providing useful information on ways to reduce disaster losses. One of the initiatives was, as will be introduced by a representative of Kobe City Board of Education later during the symposium, the production of an audio visual material on disaster education for junior high school students titled “Bringing Happiness”. The project was carried out in collaboration with our sister company Yomiuri TV and Kobe City Board of Education. The material is a combination of a DVD, which contains movie clips taken during and aftermath of the earthquake and the recovery period, and a CD, which contains related newspaper articles and photographs. Currently, all of 83 junior high schools in Kobe City use these discs for disaster education.

Furthermore, we received many orders from universities and civil society organizations across Japan after we advertised the product in the newspaper. At present, we are in the process of making similar material for elementary school children. It is expected to be completed in the end of March and we hope that it will be used widely. In the meantime, the project to create a disaster education material attracted broad attention as a new initiative by the media, and subsequently, Yomiuri TV received an excellence award by the Broadcast and Public Welfare Division of the National Association of Commercial Broadcasters in Japan.

We are co-organizing today’s symposium with Hyogo Prefecture and Kobe City in hope of sharing our experiences and initiative to promote disaster education with people from around the world. As the UNCRD Director mentioned, this event aims to raise public awareness on the importance of disaster preparedness in the context of housing safety and urban planning. I hope that you will make use of lessons learnt today throughout your lives. Thank you very much.

II. KEYNOTE ADDRESS

Urgent Needs towards Making World Housing Safe from Earthquakes – Empowering Communities

C.V.R. Murty, Chief Editor, World Housing Encyclopedia/
Professor, Indian Institute of Technology, Kanpur

Who Can Upgrade the Seismic Safety of Our Houses?

Shunsuke Otani, Professor, Chiba University

Urgent Needs towards Making World Housing Safe from Earthquakes – Empowering Communities

C.V.R. Murty
Chief Editor, World Housing Encyclopedia/
Professor
Indian Institute of Technology Kanpur

Distinguished invitees, ladies and gentlemen:

At the onset, I would like to put on record my sincere thanks to UNCRD for inviting me to Hyogo Prefecture, in particular to Kobe City, to share our experiences on what is happening in the rest of the world. What I am going to present today is a commentary of what needs to be done worldwide to prevent people from dying just because the buildings and houses are collapsing. For the purpose of discussion this afternoon, I would like to use this classification for the countries worldwide.

There are three sets of communities worldwide in terms of addressing housing safety issues; Group I countries, those that have formal systems to regulate housing constructions; Group II countries, those that know what needs to be done but don't have the collective wisdom to implement that kind of system in place; and Group III countries, which are far from recognizing that safe housing is critical in preventing people from dying. To give you an example, Japan, United States, and New Zealand and a few other countries belong to Group I countries while India and Nepal and a lot of other countries belong to Group II countries. In order to avoid criticisms, I would not mention any examples of Group III countries and I hope you will appreciate that.

In this presentation, I will use India as an example to represent the typical housing safety problems of Group II and Group III countries today. The Republic of India got its independence 60 years ago. 60 percent of India's land area is under moderate to severe earthquake risks. And we have a population of 1.1 billion, which in some cases makes it difficult to administer disaster mitigation plans and preparedness efforts. The subject of earthquake safety is not taught in any undergraduate college in the country. So we do not have formal graduates with the subject knowledge of earthquake safety coming out of colleges. And that is the reason why I think earthquake safety is a very difficult task for many countries belonging to Group III.

In addition, there is another problem these countries are faced with; that is, the growing urban areas. We have cities and towns becoming magnets, and people are migrating from the rural to urban areas. These places have been on the rise in the last two decades and particularly in the last decade. It is expected that by 2020, 70 percent of national productivity will be from 30 percent of the population, which lives in urban areas. So on one side, we are faced with vulnerable constructions and on the other side we are faced with growing urban areas with no seismic safety.

This brings us to the important question of acute shortage of safe housing in the country. UN understanding is that we will need 100,000 houses to be built every day to fill the gap of housing requirement worldwide. When you look at India alone, we are required to build 25 million

houses every year, in just one country. And if you total up all the Group III countries, there is a huge amount of houses to be built.

Let me situate India in the global trend. According to the UN report, the trend worldwide is that

- 900 million people are slum dwellers (out of 3 billion urban population);
- Population to double to over 5 billion in the next 25 years in urban areas; and
- The need for housing is more than 100,000 units/day.

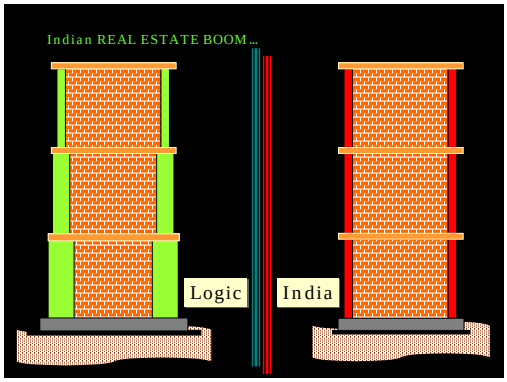
The implication of this data is that legal and institutional reforms are required. For instance, we need open regulations that govern land use, occupancy, and ownership.

In India, there is an acute shortage of housing while at the same time there is real estate boom. In the urban areas, you will see a mode of this.

If you see one window, you will see more windows and that is the way the urban development is today. It's full of concrete buildings. What is interesting to see is that there is a special class of structures that have been built, especially the class of structures that as you see an open ground story.

This open ground story has a very special feature. It's got a standard column size of 230mm, which is matching with the brick size. And these building are been built as I'm talking to you. Hospitals are been built, apartment buildings are been built, as I'm talking to you right now at this point of time.

These buildings have an interesting feature that column size remains constant throughout the height, irrespective of the number of stories, being 1-story, 3-story, 5, 7, 11, 14, or 22 stories. Today, buildings in India stand with 230mm columns, standard size. And this is antithesis to traditional knowledge that you have received in your classrooms on safety of buildings and design of buildings.



What is also clear is that in the last 100 years, experiences of earthquakes across the world have clarified that these buildings are not safe. They do not have the strength to resist earthquake shaking. And in our country, we have an example and another example. Over 5, 6 recent earthquakes in the last 2 decades have emphasized adequately that these buildings are unsafe for earthquake resistance.

What we are faced with is that one building collapses and another building stands tall and bright. And we are unable to explain this difference to the common men. While the technologists understand the difference, why this one collapsed and that one did not, the common man is not able to be convinced that why such a situation arises in countries like India.

That is the urban setting and on the rural side, this is the information you are already familiar with. Brick masonry, stone masonry buildings built across the country in seismic areas reach this fate finally.

There is little practice of implementation of seismic safety in non-engineered constructions as we call them. It is known that traditional practice does not exist. Traditional construction practices, which over time, has been forgotten by the generations that came after. And that traditional practice is something we need to bring back again to these communities.

Why is India very vulnerable? Just to give you an idea, here is some information that signifies vulnerabilities. If the next earthquake occurs, India is very vulnerable.

If we look at the data, India has 97 percent non-engineered structures and roughly 3 percent engineered structures. Here are estimates: 7,100,000 are RC, about 68,900,000 are ordinary brick, about 96,400,000 are adobe and rural and about 22,700,000 are informal buildings, with the total of 200,000,000.

Professionals in India with knowledge of design for earthquake effects are very few. This is a very sad statement. I am saddened to make this statement but this is what is happening.

In India, there is a standard but this standard is not used in most building designs. In addition, there are many loopholes to this standard. The designers can exploit it to reduce the cost and there are different levels of safety built into buildings. Moreover, there is this lack of understanding amongst designers. This is apparent in the simplified procedures adopted such as the infill walls.

Role of local government needs

strengthening. Often it proves to be inefficient in doing checks on technical quality because municipal corporation offices are not equipped to monitor technical quality. They don't have civil engineers and no system is conceived to promote quality monitoring. Local government also does indiscriminate issuance of permits to construct buildings.

There is a saying, "Earthquakes do not kill people; man, in his role as builder, kills people". The primary common problem in the group II and group III countries is structural safety. This is essentially a technology problem. The buildings are prone to collapse during earthquakes causing huge loss of lives. Our data show that most of the existing buildings are unsafe and the new ones that are being built are unsafe. We are seriously facing technology problem but we are still making some unsafe buildings now.

When we investigated our key deficiencies, we found that it is in the practice and management of earthquake reduction technology. Why? Because the organizations and agencies that are responsible have no technological background. This makes the steering of many projects ineffective. Another deficiency is that the architects and engineers are not playing their role. This is evident in their approach of offering substandard technical services leading to unsafe constructions.

In the group II and group III countries, the common problem of structural safety leads to common consequences, mainly loss of lives and huge damages. During large earthquakes, the loss of life is high and loss of housing is colossal. This is evident in the 2005 Kashmir Earthquake, where the magnitude was 7.6, loss of life was over 87,000 and the number of displaced persons was over 3.5 million. During small earthquakes, the loss of life is significant and loss of housing is staggering. This is evident during the 2006 Jogyakarta, Indonesia Earthquake with magnitude of 6.3 where loss of life was approximately 6,000 and over 1.5 million people were displaced.

After every earthquake, the housing sector is affected the most. For example, in 2001 Bhuj, India Earthquake with a magnitude of 7.7, left approximately 230,000 units to be constructed and approximately 950,000 units to be strengthened. The challenges we are facing are tremendous. This includes assessing damages to houses, undertaking seismic retrofitting of damaged houses, and constructing new earthquake resistant houses either by replacement units or by putting additional units.

What are the solutions? Where do we go from here? Earthquake is a risk, which consists of three components; namely: hazard, vulnerability, and exposure. Earthquake is a cycle. Thus, by understanding the earthquake, we can develop a 3-way action plan. The action plan needs to develop strategies to: (a) apply knowledge available internationally, (b) generate new knowledge for Indian conditions, and (c) absorb knowledge available internationally to Indian conditions by giving emphasis on mitigation and preparedness.

We believe that the main efforts required must be a multi-pronged approach. This includes first, comprehensive awareness and preparedness, which involve stakeholders, and second, systematic education, training and capacity building. This can be done by pursuing an earthquake-resistant construction by equipping manpower (e.g. technical, skilled, semi-skilled), having strong earthquake research and development program, and by having documentation program. The third approach is revision of codes and standards. This includes regular revision of existing standards and development of new standards by incorporating latest knowledge. The fourth approach is regulation and enforcement. This covers licensing of engineers, development of techno-legal regime such as town and county planning act, land-use and zoning regulations, development control regulations and building by-laws, and techno-financial regime including financial institutions and financial transactions to be made contingent on compliance. I understand that this fourth effort is the most difficult because it implies passing new policies and legislation.

If we compare the experiences of Group I countries with that of the Group II and Group III countries in terms of disaster management, we

can observe this:

(a) Group I countries (*e.g.* industrialized nations): In early 1900s, human fatalities and economic loss were high; but in early 2000s, economic loss was high and human fatalities was low. This can be attributed to the role of stakeholders.
(b) Group II and III countries: In early 1900 and even today, human fatalities and economic loss remain high.

What lessons could be learned from this? Deaths due to building collapses are completely avoidable. This needs to be the major focus for developing countries in all future projects. Significant learning is that deaths due to housing collapse are avoidable and should be the major focus for Group II and III in all future projects.

Scientific knowledge is growing. It is evident that new structures done with updated building codes are performing better than older structures with old building codes. For example, building code in Japan is updated regularly and during the 1995 Kobe Earthquake, buildings built with old code performed poorly while those built with new code performed well. On the other hand, new structures are still unsafe if the codes are not updated regularly. This is evident in the Delhi Metro Rail structures. We also learned about retrofitting. Thus, existing structures need to be retrofitted. This is expensive but is needed at least for the public buildings.

Thus, Group II and Group III countries need to have professional background in earthquake-resistant technology. There should be leading teams in implementing earthquake safety programs (i.e. architects and engineers and not bureaucrats).

Global housing safety network is a means of distributing and sharing information. Global Housing Earthquake Safety Network is a network of international professionals with specialized knowledge in earthquake-resistant housing technologies. This comprises the housing task groups, which is a network of professionals in each nation to champion housing safety needs. The housing task group will liaise with the global housing task group and receive advantage of global technology. It can also lobby governments, agencies and organizations to ensure earthquake safety in all housing projects. The key role of country housing task groups is to run the “last technical mile” for their country by guiding governments on minimum acceptable norms for ensuring earthquake safety in housing projects. It provides technical know-how to organizations and agencies that require specialized knowledge on earthquake safety. The World Housing Encyclopedia, because of its wide networks, can assist in these activities.

In Group II and Group III countries, the political will is at high level only, but not at the implementation level. We can see this in building industry, where it is seen as the major source for black money and we could say that the underworld is involved (e.g. activities common in Bombay)

Technology is way behind. Let me illustrate the case of India in two ways. First, too few experts in a country with high earthquake hazard (e.g. only 20-30 Ph.D. degree holders in earthquake engineering). Take note that this is a country of 1.1 billion population and 60 percent of land is under moderate to severe earthquake threat. Second, self-regulation of quality of services is yet to be realized.

Common man is not yet taking ownership of the problem. This is apparent in the very low awareness of prevalent earthquake risk. We are happy that one of the leading newspapers in Japan is a co-sponsor to this activity. This is a good strategy to advance education.

Education is to be stepped up first. In India, a national program of earthquake engineering education by the Ministry of Human Resource Development is promoted. We are also updating technical education (faculty members and curriculum) and waking up communities through awareness and preparedness. Education and regulation must go hand in hand to ensure housing safety.

I know I asked too much to every country but our proposed efforts can be done and are

possible. For the global technical community, our goals must be modest initially, with time targets to achieve them and build confidence. Our earthquake safety agenda is on a slow-upward ramp still, thus we need to push it up because we know that having a seismic safe environment is possible.

I would leave here with a wonderful monument from my country with the thought that "If this monument can stand for 350 years and more then why can't we build a house that could stand for 1 or 2 generations?" Thank you very much for your time.

Who Can Upgrade the Seismic Safety of Our Houses?

Shunsuke Otani
Professor, Chiba University

Good afternoon ladies and gentlemen.

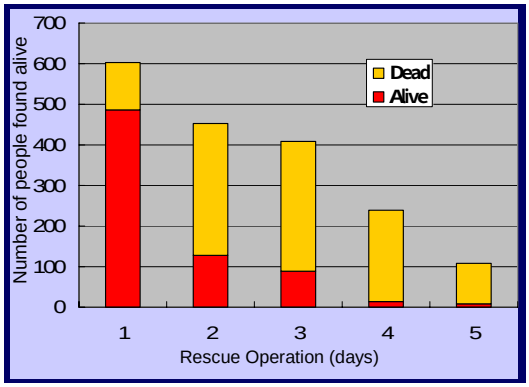
I was at work in Tokyo when the Great Hanshin-Awaji Earthquake occurred. Sensing the tremor, I thought there must have been an earthquake somewhere. I came to Kobe one month later and examined the damage of buildings and houses.

The topic of my presentation is "Who can upgrade the seismic safety of our houses?" This is not a remote, unrelated question to all of us. Earthquakes are not unique to Japan. This photograph appeared in the cover page of an American civil engineering magazine.

The earthquake in Kobe was a shocking disaster not only to Japan but also to the world. The event shocked the world.

The economic damage from the earthquake amounted to roughly 10 trillion yen, 60 percent of which was due to collapsed buildings. It is evident that building collapse caused the major damage. The number of deaths from the current estimate stands at 6,434. The figure was 5,500 immediately after the earthquake. The number of deaths increased in the aftermath because of various indirect causes. In terms of housing damage, the number of collapsed houses exceeded 100,000.

This bar graph shows the correlation between the number of days following the earthquake and the number of people found alive.



The horizontal axis represents days following the disaster and the vertical axis represents survivors. The yellow areas show the number of people who were found dead and the red areas show the number of those who were found alive. As the graph shows, the probability of finding survivors dramatically declined after the third day.

The key point is that many people were still alive and were rescued on the day of the earthquake, when Hyogo Prefecture had not asked Japan's national self defense force for help. This means

that locally-initiated rescue operations could save numerous lives. This is very notable. Many of those who were rescued on the first day survived. As Mr. Saito, the Vice-Governor, has mentioned, 87.9 percent of 5,500 deaths that resulted immediately after the earthquake were due to the collapsed buildings and houses. Further, 10 percent of them died by fire. The causes of deaths were determined based on detailed inspections including examination of the amount of smog or clay in the lung of victims. In short, many people died from the earthquake as a result of the building collapse. As Professor Murty has noted, deaths are not a result of an earthquake but of the collapse of buildings. It became evident in the Kobe Earthquake.

Statistics of Death Causes in Kobe Disaster

Cause	Number	%
Collapse of buildings	4,816	87.9
Fire	570	10.4
Highway collapse	17	0.3
Land slides	11	0.2
Overturning furniture	65	1.2
Total	5,479	100.0

Immediately after the quake

I'd like to draw your attention to the figures on the bottom of the table, which shows the number of deaths caused by overturning furniture. As shown, it claimed the lives of 65 people, or 1.2 percent of the total victims. A large number of people in Japan place heavy items such as TV on top of tall furniture inside their bedrooms. This is because of space limitations in many Japanese homes. These heavy items fall in the event of an earthquake, killing people. This might be a unique incident in Japan.

The data table showed that 87.9 percent of people died under the collapsed houses, which were predominantly wooden and traditional. Their collapse was caused by the structure of the roof. As this photograph shows, the traditional Japanese method of making a tiled roof uses clay called "fuki tsuchi", which is placed under the tiles for their orderly lining. As a result, the roof becomes heavy. The combination of weight and strong earthquake motion generates a very powerful pressure. This mechanism forces houses to collapse.

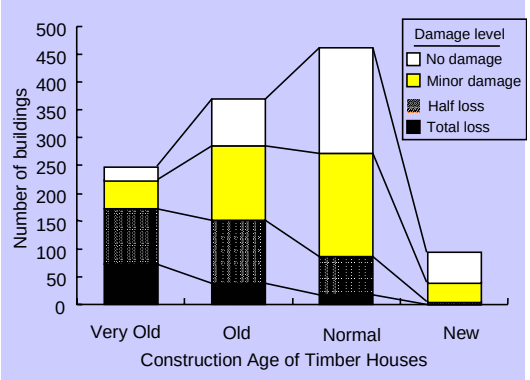
Why, then, does the traditional Japanese method add so much weight to the roof? Part of the answer comes from my own assumption. Summer in Japan is very hot, requiring the use of heat-insulating materials for the roof. The most effective way to insulate heat is the use of heavy materials such as clay and tiles. In addition, typhoons attack Japan every fall, requiring the roof to be heavy enough to withstand strong wind. Therefore, heavy materials such as tiles and clay are used. However, roofs made with these heavy materials can have a negative effect during an earthquake.

The last time Kobe experienced an earthquake of the same intensity as the 1995 earthquake was 400 years ago. A choice has to be made between ensuring safety of houses from a major earthquake that occurs once every 400 years and reducing discomfort from warm summer and protecting roofs from typhoons every year. I suppose that the Japanese people have historically chosen to install heavy roofs using their wisdom. However, a large number of people died as a result of that choice. This shows that choices they make determine their fate.

In the meantime, there are modern technologies that can ensure safety of houses with light roofs. In this photograph, there is a white area in front of this building. It is an old house that collapsed. In contract, the house behind it, which was built with new technologies, was left unharmed.

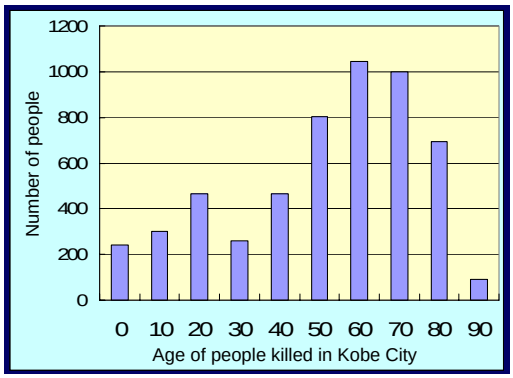
Even when the roofs are made lighter, they don't get detached from the rest of the house even with typhoon winds. Yet, these houses provide comfort in the summer time with the air conditioner. We now have such technologies that enable houses to be safe from both typhoons and earthquakes. These houses survived the tremor because of reduced pressure. We can ensure housing safety if we utilize available technologies.

This graph shows the relationship between the age of houses and the scale of damage in the town of Hokutan in Awaji Island.



The x axis shows the age of houses and those to the right are newer. Among four different colored areas, white represents the number of houses that were left undamaged, yellow slightly damaged, the lined area partially damaged, and the black area represents houses that collapsed completely. We can see that the rate of damage decreases as the houses get newer. I assume that older houses were already fragile simply for being too old. Another notable fact is that among newer houses, those that were built with new technologies were more likely to withstand pressure for collapse.

This graph shows the composition of those who lost their lives according to different age groups. The horizontal axis shows varied age groups and the vertical axis shows the number of deaths.

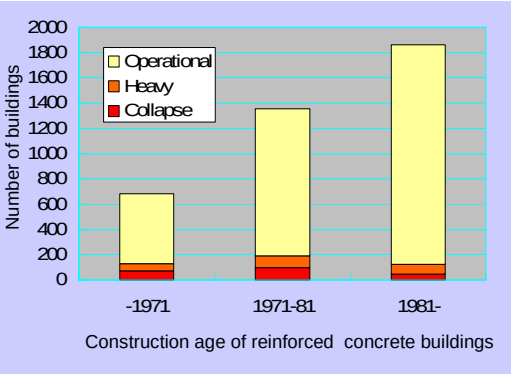


This graph makes it clear that the probability of becoming a victim increases as people grow older. Among these victims, 20 years old group makes a peak. Victims in this age group are mostly university students. The students usually live in inexpensive residential buildings, the majority of which are timber-made. It is regrettable that these buildings were vulnerable to collapse and created a peak in the number of deaths in this age group.

Meanwhile, why did so many old people lose their lives? One of the reasons is their physical weakness, which hindered their smooth escape. However, another reason could be the financial status of this population group. Because most of them do not have income, they generally do not have spare money to reinforce or rebuild their houses. Moreover, they might refrain from making any changes to their houses to preserve memories of their children's growth. Because of these and various other reasons, it is difficult to motivate older population to reinforce their houses. This might partly explain a large number of casualties among the elderly.

As for reinforced concrete buildings, the relationship between the scale of damage and different periods of building completion is shown in this graph. In Japan, a minor change was made to the building design standard in 1971. Then in 1981, the "New Anti-seismic Building Design

Law", which comprehensively spelled out aseismic building design requirements, came into force. Taking into consideration the history of these regulatory changes, it is evident that buildings built according to improved building standards and newer technologies suffered fewer damages.

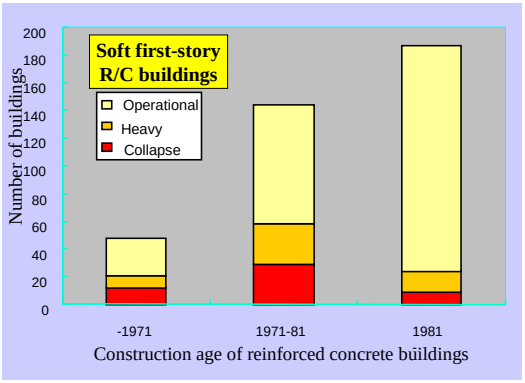


The number of buildings that were still operational after the earthquake is marked by the yellow area. The orange area denotes the number of severely damaged buildings and the red, the number of collapsed buildings. Among all collapsed buildings built with newer 1981 building code, only seven percent were regarded unusable. The remaining 93 percent could continue to be used. This fact is a result of technological advancement in Japan. As Professor Murty mentioned earlier, the scale of damage to buildings has been declining in developed countries that belong to Group I. Technological availability and high level of technological adaptation might explain this.

In the meantime, certain structural types can cause fragility to reinforced concrete buildings. An example is this type of building, which has parking space or a shop on the ground floor and apartment units above. There are walls that separate apartment units on residential floors, adding strength to withstand tremors. However, the ground floor typically does not have any walls but columns to make parking easier.

A structure like this is very vulnerable to earthquakes. Intense pressure created by a combination of the weight of the building and the ground motion concentrates on columns, resulting in severe damage or collapse when they are no longer able to withstand the pressure.

This graph shows the relationship between the year of building completion and the scale of damage to buildings with no walls on their ground floors.



Among those that were built prior to the implementation of the new anti-seismic code in 1981, a very high proportion (40-50 percent) suffered severe damage. The ratio declined for those building built after 1981. However, compared with standard reinforced concrete buildings, the scale of damage is graver. To rectify this situation, an amendment was made to the law to improve the safety of buildings whose ground floor comprises only columns.

This is a photograph of a collapsed building.

I often show this and the next photograph to building structure experts and ask them whether structural requirements should only ensure safety. I wonder how you assess the scale of damage to this building. From my perspective, or from the perspective of a building structure expert, there is almost no damage.

The weight of this building is supported by this column. The weight against the floor is once supported by this beam, and the pressure against the beam is supported by this column. It can be concluded from observation of the damage to the column and beam that the damage to the building, in form of a small number of cracks, was minimal. However, the building is no longer functional because the doors were smashed enough to hinder entry and exit. It is regrettable that too much attention was paid to the safety and prevention of major damage and too little attention was paid to preserving building functionality during an earthquake.

However, we now have technology that can isolate seismic force by placing soft rubber under column foundations that are vulnerable to destruction. This type of technology can protect buildings, windows and doors from strong pressure created by powerful geological motion.

We now have the technology that makes buildings safe. But technological availability does not necessarily translate into safety of houses and buildings. Cell phones became available because of technological advancement. But we cannot benefit from the technology unless and until we buy a cell phone and switch it on. We can derive benefits from a new technology only when we purchase and use it. We have technology that contributes to building safety. But buildings and houses cannot be protected if people do not adopt available technology. I would like you to think about this point.

Lastly, I am certain that you are well aware of the importance of seismic retrofitting of houses. Experts like myself always inform people how critical retrofitting is and advise them to reinforce their houses if their houses are old and vulnerable. Persuasion is a very simple task because it doesn't incur any financial responsibility. If you were given 5 million yen, would you retrofit your house? Or would you instead spend the money to renovate the kitchen because your wife wants it, or buy a car or pay for children's schools? Housing safety cannot be attained unless cost of retrofitting is considered as a necessary expense. This is because nobody else will pay for it. This raises a question whether people in reality will retrofit their houses even if they acknowledge the need.

It is simple to advise others to pay for

retrofitting but whether to allocate our own financial resources for that purpose is a difficult decision making. One proposal is to propose politicians to devise a policy that encourages retrofitting through government subsidies. This would be more effective than relying purely on people's voluntary efforts. This is the end of my presentation. Please remember to retrofit your houses. Thank you.

III. VIDEO SCREENING

Disaster Education Audio-Visual Material
"Bringing Happiness: Spreading Disaster Education from Kobe to the World"
Taisuke Matsuzaki, Researcher, National Institute of Multimedia Education

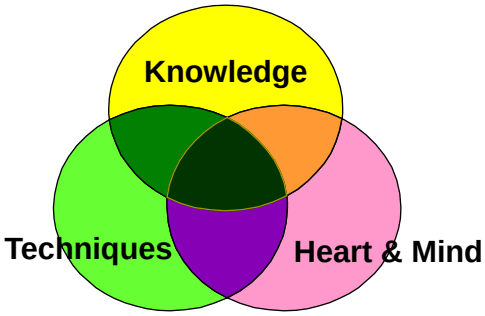
Bringing Happiness: Spreading Disaster Education from Kobe to the World

Taisuke Matsuzaki
Researcher
National Institute of Multimedia Education

Good afternoon ladies and gentlemen. My name is Taisuke Matsuzaki, researcher at the National Institute of Multimedia Education. I am also responsible for disaster education at the Kobe City Board of Education. Today, I will present on a disaster education material titled "Bringing Happiness: Spreading Disaster Education from Kobe to the World".

The education infrastructure in Kobe was severely damaged by the Great Hanshin-Awaji Earthquake 12 years ago. Many children and teachers lost their lives and 85 percent of all schools in the city were damaged. Many were forced to seek shelter at schools. In the meantime, education infrastructure in Kobe has recovered owing to enormous efforts made by those who work in the field of education.

Disaster education began in Kobe with the mission of making the most out of the disaster experiences and lessons learnt from the event in the post-earthquake period. As this diagram shows, the key is converging three elements: knowledge, techniques, and heart and mind. Knowledge means knowledge on disaster prevention. It covers topics such as earthquake mechanism and history of earthquake disasters. The second element of techniques aims to teach students how to protect their own lives, a key question that arose during and after the disaster. The third element is heart and mind. We learned the fragility of human lives and the value of cooperation and peer support. The disaster education aspires to teach these three key elements.



As we have been performing various disaster education initiatives for the past 12 years, we have come to face several challenges. One of them is fading memories with time. People that have no first-hand experience of disaster increase every year. Teachers who lack disaster experience have to teach children about disaster. The third challenge is the increasing demand for education on non-natural disasters, for instance, those that are human made. Based on these developments, we have come to a conclusion that conducting disaster education at schools is not enough. It needs collaboration and participation of communities. Increasing demand for improved disaster educational materials led to the development of this audio visual educational material.

I will now introduce the audio visual material "Bringing Happiness". It was made in March last year with collaboration among Yomiuri Shimbun Osaka, Yomiuri TV and Kobe City Board of Education. It consists of a DVD and a CD. The DVD has a wealth of movie clips

made by Yomiuri TV. The CD contains newspaper articles and photographs. The articles and photographs can be printed and used as sources of information at schools. Moreover, the product contains teaching instructions for teachers. Hence, these two discs enable schools to readily start disaster education. Resources used were carefully selected by school teachers in charge of students' physical and emotional recovery.

I will show you selected clips from the DVD. The film section consists of three parts: the first part is titled "What happened" and shows you the actual circumstances during and after the earthquake.

(Screening)

The next clip is titled "What happened in schools…" and shows you situations at schools on the day of the earthquake.

(Screening)

The next clip is about the mechanism of tsunami generation during an earthquake used in science classes.

(Screening)

The last clip is from the section on "To live together". It shows you what children and the rest of us can do to support disaster victims.

(Screening)

This educational material has been in wide use, not limited to schools in Kobe City, but also schools in other cities and regions. It has also been adopted as a resource for teachers' training. Universities are also using these discs. Students from a school in Hiroshima use it for disaster education before coming to Kobe on their school trip. The discs have also been used for disaster-related journals, trainings in nursing schools, and for emergency risk management training by local governments and businesses.

Furthermore, use of the material has been spreading beyond Japan. For instance, it was introduced in Armenia, which experienced a disastrous earthquake that killed 28,000 people in 1988. The country is developing a disaster education curriculum in response to its urgent need. I had a chance to demonstrate this material in the country last November. It seems to have appealed to teachers and students. There are now talks to jointly develop similar educational materials.

The second example is the Republic of Algeria in Africa. A severe earthquake struck the country in 2003. There is a movement to translate this audio visual material into Arabic or French and use it nationwide.

I feel that there are commonalities in disaster education across countries. Aspects such as knowledge dissemination, techniques of self-protection, and the value of human lives and interpersonal ties are integral aspects. And because of that, there is no national boundary for disaster education. The song you are listening to now is an Armenian recovery song that was

composed after the 1988 earthquake. Because the population is small, everyone in the country can sing this. The song was composed to encourage people to recover like a phoenix and rebuilt the country. I feel that lessons learnt from disaster experience have already been integrated into culture in many parts of the world.

Importantly, schools can play a major role in promoting and disseminating ideas to create a culture of disaster prevention. One example is awareness through a play. There is a play called "Disaster Prevention Station in the Forest" done at some kindergartens. In the play, a fairy in the forest foresees an upcoming natural hazard and tells animals to prepare for it. Then, a rabbit tries to reinforce its house. I believe that things such as songs and plays are important sources of disaster education. Disaster education should be a common heritage for humanity by incorporating diverse ideas.

This is an example done at schools in Kobe. The left picture shows children crouched in corrugated cartons. It is a game in which children compete on time to evacuate to a safe haven. In the event of a disaster such as fire, we are often forced to crawl on the floor in the darkness to escape. This game simulates that situation and aims to train children to hurry in the direction of the sound where a safe haven is.

The right photograph shows children competing to collect items written on emergency preparation bags. They compete on how fast they can collect required items such as radio and water. Children enjoy these games.

Our task is to make disaster education useful and enjoyable for current and future generations. These children are about 10 years of age and don't know anything about Kobe Earthquake. They don't know anything about the intention of this sport event. But I trust that they will understand the meaning if we tell them that the aim is to equip them to protect their own lives in case of a disaster and that it is our hope to pass lessons from the earthquake to future generations. I believe this type of disaster education will eventually contribute to promote culture of disaster prevention. Armenia and Algeria I mentioned earlier also have their own ideas on disaster education from which we can learn. I think that mutual exchange of knowledge and experiences is the best way to prevent fading of disaster memory and to raise awareness on the need for disaster preparedness.

Lastly, I would like to introduce a song sung on the 17th of January by children in most schools in Kobe.

(Chorus)

Thank you very much. Currently, following the completion of this audio-visual material for junior high school students, we have been preparing the same material for elementary school children. It's expected to be finished in March. These two educational sources show our gratitude to the world for its assistance in the period of post-disaster difficulty as well as our message to prevent oblivion of lessons learnt from our disaster experience. We hope to continue our effort to hand down culture of disaster prevention to future generations by making useful educational materials. Thank you very much for your attention.

IV. CASE STUDY PRESENTATIONS
V. UNCRD PRESENTATION

Housing and Building Safety Programs in Indonesia
Antonius Budiono, Director-General
Directorate for Human Settlement, Ministry of Physical Planning and Works, Indonesia

Community Initiatives for Disaster Reduction in Kushimoto, Japan: Attempting to prepare for a highly-probable Nankai (South Sea) Earthquake and Tsunami
Isao Hayashi, Professor, National Museum of Ethnology, Japan

Education and Training for Safer Housing in Nepal
Amod Mani Dixit, Executive Director
National Society for Earthquake Technology-Nepal (NSET)

Earthquake Safety for Traditional Housing in Peru
Javier R. Pique, Dean. Board of Engineers of Peru– CD Lima/
President, Peruvian Permanent Committee for Seismic Design

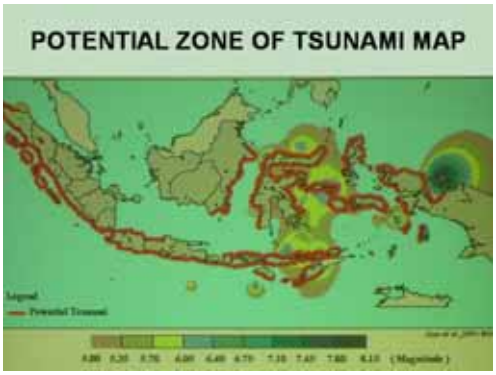
Housing Earthquake Safety Initiative: Building Culture of Housing Safety
Bishnu Hari Pandey, Researcher
UNCRD Disaster Management Planning Hyogo Office

Housing and Building Safety Programs in Indonesia

Antonius Budiono
Director-General
Directorate for Human Settlement
Ministry of Physical Planning and Works
Indonesia

Good afternoon ladies and gentlemen. I will be presenting a case study regarding housing and building safety programs in Indonesia. The main problem we are facing in terms of housing and building safety is that not all buildings have permits. This means that buildings without permits may not be following national building standards. That is why when earthquakes occur, many buildings collapse. Another related problem is that many of those buildings with permits do not meet the building technical requirements. In particular, these buildings are not meeting the requirements for fire safety, earthquake preparations, facilities for disabled people, and the like. Recently, big earthquakes occurred in Sumatera, Aceh and Yogyakarta in Indonesia. Many people lost their lives. In Sumatera, approximately 2,000 people lost their lives. In Yogyakarta around 3,000 people and in Aceh, around 1,000 people.

Let me show you a map showing the potential zone of tsunami in Indonesia. This is based on our historical experience, where we indicate the areas of high-risk of tsunamis. The Western part of Sumatra, Southern Part of Java, Bali, and Papua islands are all at high-risks of tsunamis.



Since we are experiencing lots of earthquakes, the Ministry of Public Works issued Decree No.441/KPTS/1998, which outlines the National Guidelines regarding the National Building Code. Then finally in 2002, we enforced the National Standards (SNI 03-1726-2002).

In the next slides I will discuss in some detail the issues regarding our efforts in addressing great disasters in Indonesia, namely, those that occurred in Nabire, Papua in 2003, Nanggroe, Aceh Darussalam in December 2004, Nias in May 2005, and Yogyakarta in May 2006. In the Aceh disaster, many buildings and houses were destroyed not because of the earthquake but because of the tsunami. You can see from the photos here the extent of the damaged. Actually, many of the buildings in Indonesia are already earthquake resistant but these damaged shown

here were caused by tsunami. In the Jogja Earthquake, many buildings and houses also collapsed. Those three photos showing collapsed buildings are the old buildings, which were not earthquake-resistant.

I want to bring your attention to the photo on the bottom-right. This building did not collapse. This is a new building that we designed and it is earthquake-resistant. In this next photo, we can see the damages of the disaster in Mandahiling, Sumatera. Landlines caused these damages. Right now, we are still in the process of reconstructing damaged buildings.

Our approach in reconstructing damaged housing adheres to the idea of community empowerment. We tried to assist the community to rebuild their own houses based on their construction experience, which is done in traditional way. We are assisting them in making these houses safer. If they want to build their houses in a modern way, we provide some designs like what you can see in the picture. We are adapting this approach not only in Jogja but also in other areas that experienced great disasters.

In 2002, Indonesia enforced the Building Law (No. 28/2002). On the basis of this Law, the Government issued Regulation No. 36 in 2005 outlining the implementation of Building Law. With Regulation No. 36, Building Standards were drafted. Now, we are assisting the local governments in drafting their own Local Buildings Act (LBA) in relation to these various issuances. The objective of the LBA is to address the issues by considering the local social, cultural, economic, and geographic conditions. We are assisting local governments to fulfill this so that community life will become better.

We will further strengthen our efforts for safer housing in Indonesia and here are some of our future targets. First, based on the provisions regulated in the Building Law and the Constructions Services Law, the government in coordination with the professionals and other stakeholders will review and improve all previous regulations and standards related to building construction process. Second, in 2010 all public buildings should have operability certificates. This certificate will ascertain that the building is safe. Finally, in 2010 all kabupaten/kota – which count to more than 450 – should have their own Local Building Acts. This last target looks very difficult because right now we have less than 50 percent of the local governments that have Local Building Acts. So every year, we are assisting around 33 local governments in drafting their own Local Building Acts. I know that these targets are very ambitious. However these targets are directed towards helping local communities to have safer buildings and houses.

I think that is all for my presentation. Thank you very much.

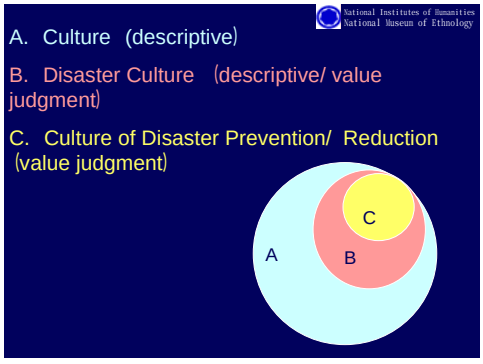
Community Initiatives for Disaster Reduction in Kushimoto, Japan: Attempting to prepare for a highly probable Nankai Earthquake and Tsunami

Isao Hayashi
Professor
National Museum of Ethnology
Japan

Good afternoon, ladies and gentlemen. My name is Isao Hayashi and I am a professor at the National Museum of Ethnology. As some of you may know, the museum conducts research and exhibits artifacts related to cultures and lives of people in different regions across the world. My area of specialty is the Pacific region and Oceania. In the last three years, I have been doing research on disaster affected areas in Japan as well as disaster prevention initiatives in various locations in the country. Today, I will present a case on the town of Kushimoto, which has a high probability of being affected by a large-scale earthquake and tsunami disaster in the near future.

Since I believe I was invited to this event because of my expertise in culture, I would like to briefly talk about the concept of culture. The word "culture" has multiple meanings in English, and past research reveals that the meanings have evolved over time. The same can be said for the Japanese equivalent word "bunka". Today, I will present two concepts that help us interpret the word "culture". The first is descriptive concept. It might be slightly difficult to understand but culture is interpreted as commonly shared within a given society, is acquired after birth through learning, and hence, humans are not born with it. It points to abstract ideas instead of individual customs and acts. It is a principle that determines various customs and acts. Culture in this concept signifies uniqueness, individuality and regeneration.

The other concept is a culture that has specific value attached to it. You might envisage culture in this interpretative way when you hear words such as traditional culture and cultural art. This concept will be further explored in my presentation later. Young people might not know these words but there used to be expressions like "bunka jutaku (cultural house)", "bunka bouchou (cultural knife)", and "bunka nabe (cultural pot)". The word "bunka jin (cultural person)" is still used. The word "bunka (culture)" was created to refer to things considered to be modern and sophisticated. I believe that the word has nuances such as advancement, sophistication and universality. I wonder which concept you attach to the term "culture of disaster prevention", the theme of today's symposium. The word "culture" is, of course, used in both concepts.



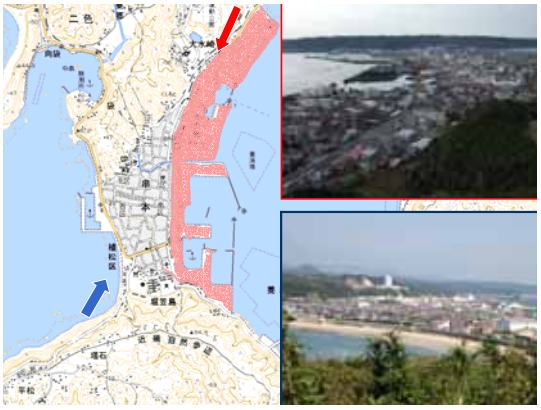
When I referred to individuality a while ago, I explained the word "culture" based on the

descriptive concept. Words such as youth culture, corporate culture, sub culture and ethnic culture used in the media represent descriptive culture. In contract, traditional culture and cultural art have an essence of value judgment. I will present a case of Kushimoto in Wakayama Prefecture today, but the main point I want to make is in this slide. While the term "culture of disaster prevention" is used, it is impossible to establish an entirely new culture from scratch. Prior to creating or encouraging cultural habits associated with disaster prevention, there has already been a culture in which people are accustomed to live. To promote disaster prevention, it is imperative to understand the existing culture, which is to be a foundation of a new culture. It is also necessary to understand people's perceptions on disaster in their daily lives, what disaster they have experienced in the past, how vivid their disaster memories are, and what and how they have attempted to make use of the lessons learnt from the disaster experience.

Around January 17th, there are numerous events, conferences and symposiums related to disaster prevention in Kobe and other parts of the country. Two terms, "disaster culture" and "culture of disaster prevention", are often used in these events. I saw one flier announcing another symposium on culture of disaster prevention scheduled for near future. Hence, the term "culture of disaster prevention" has an essence of creating value. Because disaster culture requires human actions, its promotion requires accurate understanding of existing culture, people's lives and their patterns of thought and action.

As introduced earlier in a DVD, there is a growing concern in Japan over anticipated Tokai (East Sea), Tonankai (South-east Sea) and Nankai (South Sea) Earthquakes of magnitude higher than 8. Today, I will introduce the town of Kuchimoto, which has suffered significant damage from multiple earthquakes and tsunamis in the past. One such event was the Showa Nankai Earthquake, which occurred on December 21st, 1946. The earthquake, with its epicenter on the bottom of the sea 50km away from Cape Shio on the southern edge of Ki Peninsula in Wakayama Prefecture, caused severe damage ranging from central Japan to Kyushu Island. The number of those who died or went missing amounted to 1,400. A total of 25,000 houses were fully or partially damaged, and 1,400 houses were washed away by the tsunami.

Wakayama Prefecture is situated in the center of Honshu Island and has the island's southern-most cape. From the earthquake and tsunami, 269 people lost their lives or went missing and 3,800 houses were damaged or lost in the prefecture. These photographs show downtown Kushimoto, which was created by 13 reclamation projects between 1918 and 1975. This photograph is a view from the north. In contrast, this is a view from the south.



Kushimoto has approximately 20,000 inhabitants, or 9,400 households. Aging population, which is a nationwide problem in Japan, is also a characteristic of the town. In fact, 30.7 percent of the population is over 65 years of age.

A tsunami of an average 4-5 meter and up to 7.9 meter high, hit downtown Kushimoto following the 1946 Nankai Earthquake, resulting in nine deaths. Immediately after the disaster, local Kushimoto Elementary School formed a group to study the situation. Similarly, members of a history club at local Kushimoto High School interviewed survivors and published a book titled "Records of the 1946 Nankai Earthquake: Witness of Survivors" in 1977. Part of the book appeared later in a local South Kishu Times, and currently, contents are posted on the Kushimoto town government website. To remind people of the disaster experience, the government also set up a pole in the town that indicates the height of the powerful tsunami. There has been a similar

attempt by Tanami Junior High School in Kushimoto, which prepared a report on the Nankai Earthquake based on interviews with those who experienced the disaster.

Efforts by the town government and schools to learn from the past experience and prepare for future disasters have continued for the past 60 years. In addition, residents have preserved various artifacts and attempted to pass their personal accounts down to children and youth population. This photograph is a victimization certificate. There are people who have kept this for 60 years.

Currently, there are a total of 22 disaster management organizations in Kushimoto, 21 of which are self-governed and one has no established rules. I have studied 10 of them in the past 2 years. All differ in size, foundation history, member composition and activities. Due to time constraint, it's not possible to introduce all of these organizations, so let me introduce the Omisaki Self Disaster Management Organization, which once received media coverage. This organization is located in a district on a reclaimed land less than three meters above the sea level.

In 1995, the mayor of the town of Okushiri in Hokkaido, which experienced a disastrous tsunami in the past, visited Kushimoto and made a speech about the importance of establishing as many evacuation routes as possible to avoid human casualties. Following the speech, the head of Omisaki District petitioned the Kushimoto town government to set up an evacuation route that would enable people in his district to escape safely to hills. Because the town government was reluctant to accept his petition, his district took an independent initiative to establish one on its own.

There was an evacuation route designated by the town government but it was obvious that the route would not be safe if a tsunami of 4-7 meter high reaches the district within 10 minutes following an earthquake. The newly established route provided a shortcut to a safe location. The district used its own fund because the town government was reluctant to contribute to the plan. In the end, the town government was moved by the efforts made by citizens of Omisaki District and completed the project by extending the route.

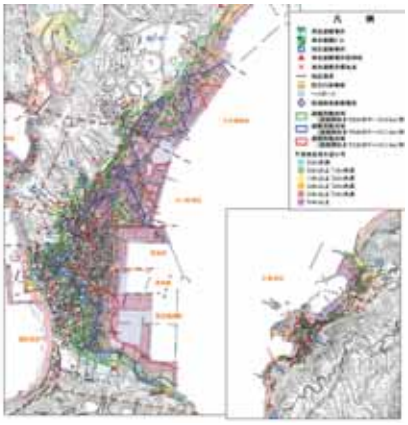
There was a similar initiative in Fukuro, a district in Kushimoto that suffered the most severe damage from the Nankai Earthquake. The district has no designated safe haven and there used to be few paved evacuation routes. However, district residents made voluntary efforts to set up escape routes. Similarly, they marked a line on highway walls indicating the height of the past tsunami to alert people how high a tsunami can be. Further, people built a facility to store emergency aid equipment. There is also an idea to keep new clothes in the storage.

Other similar initiatives started with setting

up a sea level indication sign. It was done independently by different districts and each disaster management organization adopted its own sign. But eventually, a uniform sign was adopted and set up by junior high school students. These students led the movement in hope of increasing awareness on their town's geographic and environmental vulnerabilities and attracting interest of the adult population in risk reduction activities.

Certainly, the town government, in parallel, has been actively working to address disaster mitigation from various aspects in collaboration with Wakayama Prefecture.

Currently, governments and citizens are jointly developing a map designed to raise awareness within the public on vulnerabilities of their regions. This map shows the height of past tsunamis and the locations of safe havens. This map was made to inform citizens of their potential risk that may arise from possible future disaster.



While governments have led mapping, evacuation and emergency aid trainings, districts and disaster management organizations have come up with their own ideas such as card play and walking events to help people to discover risks posed by various obstacles along the evacuation routes. Individual households have also endeavored to prepare for a possible earthquake and tsunami. Governments also have set up tsunami evacuation towers to develop safe infrastructure.

Lastly, I would like to address our very common but problematic tendency. We tend to assume that "understanding different cultures" equals acknowledging that different customs and acts originate in cultural differences. In reality, this assumption results in the end of an attempt to truly understand a different culture. What is needed is an effort to understand differences and uniqueness that are enshrined in each culture. The same fact applies to disaster prevention.

The level of awareness on the need for disaster prevention and resulting activities differ among different regions. In the case of Kushimoto, a high level of awareness and vigorous activities owe to the past disaster experiences including the Nankai Earthquake, and the motivation and durability of leaders. Earlier, I explained two concepts attached to the word "culture". To sustain disaster management activities, we must attach an essence of sophistication to these activities based on deep understanding of disaster culture. Creating a culture of disaster prevention requires this process. It is often said that disaster mitigation should combine three elements: self-support,

mutual assistance and public aid, in the order of importance. However, I think that these three share the same degree of significance and are mutually reinforcing. Community initiatives can lead to successful self-help efforts, for instance, promoting retrofitting of houses supported by the government. The public sector can support communities that have taken such initiative.

My presentation exceeded the time limit but this is the end of my presentation. Thank you very much for your attention.

Education and Training for Safer Housing in Nepal

Amod Mani Dixit
Executive Director
National Society for Earthquake
Technology-Nepal (NSET)

Good afternoon. I am privileged to be here in Kobe, Hyogo Prefecture.

I am assigned to talk about Education and Training for Safer Housing in Nepal. As a starting point, I will give you a general description about Nepal. Our country faces high risk of earthquakes. It stands as the 11th worst earthquake vulnerable country in the world. This makes Kathmandu Valley the most at-risk settlement among the 21 cities in the high seismicity zones of the world. Nepal is also one of the weakest economies with very low Human Development Index.

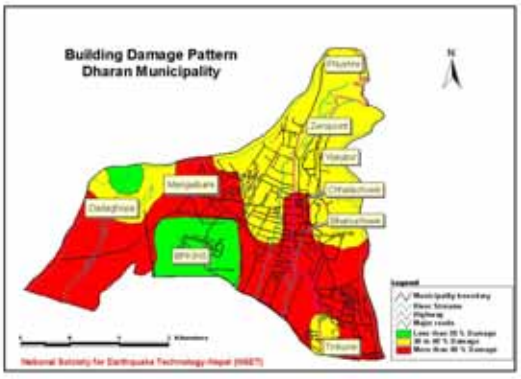
As an overview of building practices, about 90 percent of the buildings are non-engineered. The owners build their own buildings and we could say that the process of building is generally informal. It is more of a ritual in a sense that there is little or no involvement at all of technicians. Thus, the key advisor in constructing building is generally a local craftsman. In this regard, the materials that are predominantly used are those traditional materials like bricks, stones, poor concrete, and the like. On the social side, many people in Nepal don't know much about earthquakes. Generally, the level of awareness is very low even among policymakers, building professionals, literate masses, and especially the general public. At some point, there is this fatalistic attitude that "Earthquake is an Act of God". This low level of awareness may be attributed to the low-income level, which further leads to inaccessibility to knowledge, skills and materials. This low level of awareness in Nepal persisted because we are facing issues on knowledge dissemination. The people, who are supposed to take this responsibility, are experiencing various limitations. For instance, academic institutes sometimes fail to consider local needs, socioeconomics, culture, and building production mechanisms in promoting safety. Professionals in universities, mid-level technicians, and personnel at vocational schools do not receive training on earthquake-resistant technologies. In addition, knowledge and information often fail to consider or recognize indigenous materials and technologies. In addition, there is this practice in Nepal that once information reaches the technician level, the dissemination process is considered complete.

Now if we look at the building designs and the granting of permit process in Nepal, a lot of issues could be observed. First, the permit system in municipalities generally functions only as revenue generation. Permit system is not understood as regulatory mechanisms for safe buildings. Thus, if we look deeper into the permit process, there is no provision of strength criteria and there are no professionals who are assigned to screen the permits. Again, most municipalities perceive the function of the permit system as simply a revenue generating activity. Second, it is apparent from these observations that municipalities have inadequate institutional, financial and technical capabilities.

What are our approaches in addressing these problems? First, our building code itself addresses both formal and informal building production processes. On the bases of the building code, we have produced three other

issuances, namely, (a) the Code for Engineered Structures, (b) the Mandatory Rule of Thumb for non-engineered buildings by pre-engineering, and (c) the Guidelines for Rural Constructions. Second, we promote earthquake risk management through community-based approaches. Third, we intensively promote Earthquake Awareness for All. We cover children, teachers, parents, community leaders, social mobilizers, and even policymakers. Fourth, we are now using sound engineering for solving local problems. For instance, we are teaching groups of people how to make earthquake-resistant adobe or brick masonry buildings and at the time teaching them how to retrofit brick masonry for rural school buildings. Fifth, we also advocate for better policy and legal environment in promoting safer building. Likewise, we invest in earthquake vulnerability reduction. After many years of experiencing earthquakes, we have just been talking and talking about solutions and approaches to the point that we ended up just talking about the problem. Finally, we stop the talk and we go for action. We know that we will be learning by doing.

Now let me show you some bright sides of my presentation. These are some of our innovations. This is a map of a municipality.



This map could be a simple but useful tool in building damage estimation in case of earthquake occurrence. The people who are living here could together estimate the building damage. Again, this is a very useful tool in understanding what they are talking about. With this tool, the estimation could be done right there. Now once everybody understands the assessment, then anybody could think of the next plan. The photo in this slide provides you a glimpse of the people participating in the two sessions pertaining to the mandatory rule of thumb training in a very small municipality in western Nepal.

We are also implementing the School Safety Earthquake Program (SESP). You can see the reconstruction and retrofitting of a brick masonry rural school building. Nobody believes that Nepal could retrofit a school building. People criticized us. They said, “You are crazy, don’t go for that”. But now people understand that by doing that building becomes safer – perhaps safer than some of those in Kathmandu.

The photos in the slides show the implementation components, which include increasing level of awareness, training, and then actual construction.

We also enhance local skills by providing training to those people you saw retrofitting school buildings who are actually local masons. We noticed that the more we train them, the better they become. In addition to that, we also enhance the skills not only of local masons but also of petty contractors as well through capacity

building.

What we are doing is that we give them more heart and mind of doing safer buildings than the technologies. What is interesting is that this approach works. We observed that by giving them hearts and minds they could not afford to make unsafe buildings. If we focused only on technologies, some masons may argue because they have been constructing buildings for many years and somehow it is not easy for them to simply discard the traditional practices. So with hearts and minds, they will improve by adapting new technologies.

Once we created the demand, we then facilitate the establishment of the Ward-level Disaster Management Committee. This comprises small gathering of people at the community. In memory of the 1934 earthquake, we commemorate the "Earthquake Safety Day". In Japan, I saw yesterday how they commemorate the Great Hanshin Earthquake at the Museum in HAT Kobe. In Nepal, we have parades, motorcades, and rallies. At the center of the slide, you will see the Earthquake Monument built sometime in 1972 at the center of Kathmandu.

Who are these people participating in the Earthquake Day? As you can see, all stakeholders are there. The professionals, policymakers, teachers, students, masons, contractors, and all others concerned are there to participate. This activity is for everybody. One very interesting activity during the Earthquake Safety Day was the Shake Table Demonstration. People have this notion that "seeing is believing". Here they can see how to make their houses safer. We are also conducting orientation to house owners regarding earthquake safety measures.

Among the other activities, we also initiated the Earthquake Mobile Clinics. The objectives of this project include bringing knowledge of safer building construction right there in the construction site, assisting people in building code implementation at the site, monitoring of impact of earthquake awareness, and stimulating house owners and builders to consider earthquake risks. While we are observing this activity, it appears to be successful. In another project, we also try to win the hearts and minds of people concerning dangers of earthquakes through the "Vulnerability Tour" activities. By showing to lay people and to policymakers the extent of vulnerability, they will realize the urgency of urban earthquake vulnerability reduction initiatives. It is also through these activities that we can help expand people's perception on seismic vulnerability of building structures and the need to improve them. The tour could also encourage looking for champions in developing their own vulnerability tour in their respective wards and cities.

In addition, we also strongly disseminate information. Our publications include manuals,

calendars, posters, comics, FAQs, and the likes.

We are utilizing the mass media to communicate the importance risk-management. For example, we have FM radio programs in Kathmandu and Pokhara, we have TV programs, we have public service announcements, and we appear in interviews especially during Earthquake Safety Day and actual earthquakes. Then we also have continuing lectures/orientation programs on earthquake risks. Among the target groups in these learning activities are house owners, national planning commission ministries, ward committees at the municipalities, Rotary, Lions, Jaycees clubs, NGOs, CBOs, international NGOs, schools, UN agencies, bilateral agencies, and international communities and embassies.

In this slide you will see the handover of school to the community.

In this inauguration, you will also see the mass of people coming. This is a manifestation that we are not only winning the hearts but also the minds of people towards construction of safer buildings. So as far as these activities are concerned, I could say that the effort of improving non-engineered constructions in Nepal is working.

In conclusion, our various efforts and activities lead to the following results. It enhanced the earthquake awareness level of the community; it leads to better policies; it encourages wider engagement; it leads to construction of better houses; and the most important is that overall it demonstrated the feasibility of addressing issues on disaster management as it relates to technical, social, cultural and economic factors. This experience has allowed us to influence those people who are making the policies. As you have seen, there are also so many activities we have done in Nepal but there are many more miles to go. What we have started has to continue and there is no stopping now. This is what we are doing. Thank you very much for your attention.

Earthquake Safety for Traditional Housing in Peru

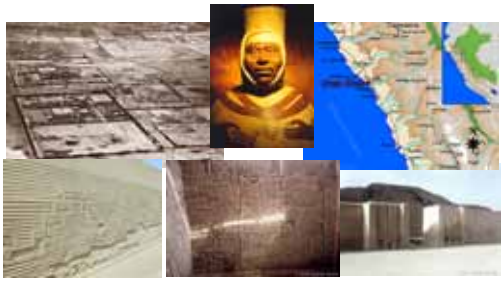
Javier R. Pique
Dean. Board of Engineers of Peru– CD Lima/
President, Peruvian Permanent Committee for Seismic Design

Konnichiwa! I first came to Japan in 1988. I am impressed by Japan because it is clean and the people are honest. I am glad to be in this land again. I would like to thank UNCRD for inviting me to share the experience of Peru.

This slide shows the location of Peru. The country occupies central west South America.

In the past it was the base of the Inca Empire. From 16 to 19 century, a Spanish Viceroyalty grouped Ecuador, Bolivia, and north Chile. The oldest documented occupation of the central Peruvian Andes is dated back in 17,500 B.C. Historically, Peruvian cultures comprise Caral, Chavin, Huari, Chimu, Mochica, Chan, Nazca and Inca. The Peruvian coast along the Pacific Ocean is a desert land crossed by rivers descending from the high Andes. The highlands represent 60 percent of the land. In the east lies the Amazon Basin with tropical weather conditions. This means that every zone has produced its own traditional housing conditions depending on materials available. Generally, the available materials include adobe and mud walls in the Coast, stone and adobe in the highlands, and timbers in the jungle.

How did the traditional housing evolve in Peru? Construction techniques depend on location and have evolved with time. Construction along the Peruvian coast, both during the pre-Inca and pre-Hispanic periods, was mud based. For example, the Chan Chan was the largest mud city of the Americas, which is estimated to have had 100,000 inhabitants during the 1300-1500 A.D., built with adobe and mud walls. This slide shows that adobe and mud walls made up the Chan Chan city. The city was largely adobe and in the inside they decorated the walls and put some monuments of people and animals.



I would like to point out that construction along the coast was always mud/adobe based. The ones which I am showing in this slide are photos of constructions along the coast. In Lima, as you can see here, the construction is also mud/adobe based. These are photos of Pachacamac and Paramonga.

However, in the high Andes, the construction was mainly stone based. If we go to highlands, you can see lots of stone based constructions.

This slide shows photos of constructions near the mountains and agricultural lands and you will also see that the constructions are stone based.

So historically during colonial times, construction types can be: adobe and timber for buildings along the coast – but for important buildings like churches, these were made of brick, sand, and lime mortar; stone for public or important buildings; and adobe or mud walls for housing. This slide shows that the church was made of brick, sand, and lime mortar. You see the Inca walls and on the top is the Spanish church. This is how Peru looked like before.

In modern times, traditional housing in Peru can be grouped according to Kuriowa. One, those comprising heavy un-reinforced light roof – made of mud, stone, brick, or concrete block, light roof. This group of houses is vulnerable during earthquakes. Two, those houses made of timber or cane. Three, those reinforced masonry made of bricks or concrete blocks. According to the 2005 census, the materials of housing walls in Peru are: 46 percent masonry (brick or concrete block), 36 percent adobe, 8 percent timber, 3 percent timber and cane plaster with mud (called quincha), and 2 percent volcanic stone and others with cement or mud. The slides, which I am showing now, are photos of buildings belonging to different groupings.

This building in Lima is comprised of brick, lime, and cane. This other building is made of volcanic stones, and these other photos show the variety of materials.

Now we may ask how these traditional materials respond to seismic behavior? Let me give you two points. First, damage to adobe or mud construction is widespread in earthquakes with intensities higher than 7 (MM). Soil conditions are critical in influencing response. If in good soil, it will go better but if in soft soil, the damage will highly increase. Second, “quincha” behaves much better due to lower mass and high flexibility and ductility. Un-reinforced masonry is easily damaged while confined masonry behaves relatively well. We learned the lessons from our experiences. For example, in 1970, there was an earthquake in Huaraz, where about 67,000 people died. We had a lot of adobe constructions and you can see the extent of damage at that time.

From that time on, we started to develop standards for adobe constructions. First, regarding adobe or mud walls’ seismic behavior, this type of construction exhibited “corner failures” and “out of plane” as you can see in the slides.

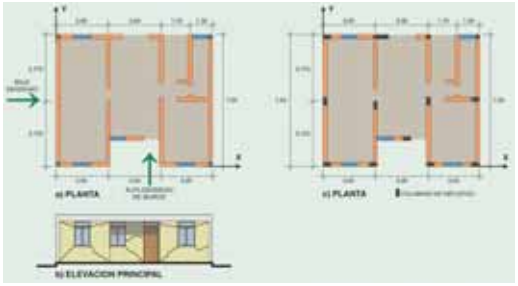
We are addressing the failures through "Reforzamiento de Adobe", which basically lower the height and the use of collar beam. In the real constructions, you can see here in the slides improved adobe houses. In my university we are proposing an approach of "reinforcing for less vulnerability". We have done laboratory testing for this approach of reinforcement and the result showed high strength and ductility. In the full scale model 1.0g pga, the roof did not fall.

Full scale model 0,8g pga

Full scale model 1,0g pga. Roof did not fall

Another approach that we have done in the university is the "exterior reinforcing wire mesh" as you can see in this slide.

This approach is also very successful. You can see a small one-story building here with steel mesh and concrete walls. This house survived the earthquake while those without mesh did not. At CISMID, we also developed a reinforced adobe that improves strength and ductility. To prove that, this is the graphical presentation of the CISMID laboratory test. So we can now say that the technologies are there. Second, regarding quincha (wattle and daub) houses, we developed modular quincha as alternative for low housing. Finally, regarding masonry houses, we noted that seismic resistance depends on wall density. What we are doing in this regard is reinforcing masonry with confined concrete columns. You can see in this slide the confining concrete columns.



In my university, we are also demonstrating some techniques on construction. We are working with some organizations in Japan, which are helping us so that people in Peru will replicate these kinds of constructions.

In conclusion, we see three points. First, seismic resistance of traditional housing can be improved though adequate and diverse reinforcing techniques. Second, there are available standards to guarantee a minimum of strength and ductility. Third, long term solution depends on urban development plan. In this regard, the sustainable cities program (Kuroiwa) is an important strategy. We know the technologies are there. What we really need is to increase the level of awareness of people and policymakers. In the end, we think that improving non-engineered construction will improve economic growth in the long-term perspectives. Thank you for your attention. Arigatou Gozaimashita!

Housing Earthquake Safety Initiative: Building Culture of Housing Safety

Bishnu Hari Pandey
Researcher
UNCRD Disaster Management Planning
Hyogo Office

Good afternoon, konnichiwa! I am Bishnu Hari Pandey from the United Nations Centre for Regional Development, Disaster Management Planning Hyogo Office. Today, I will discuss Building a Culture of Housing Safety in the context of Housing Earthquake Safety Initiative. When we say culture in terms of housing safety, we generally consider aspects of housing structures, tools and technologies, and physical environment, whether the people who live there are safe.

How do we view disaster management at UNCRD? Essentially, we link disaster management to sustainable development. In 1985, UNCRD initiated disaster management program aimed at improving capacity building of communities as well as raising the level of awareness. In 1999, the Disaster Management Hyogo Office was established, whose activities include various community based disaster management initiatives, introduction of best practices, and dissemination of information and technologies based on lessons learned from the Kobe Earthquake in 1995 as well as from the initiatives stipulated in the International Decade of Natural Disaster Reduction (IDNDR). All these efforts and initiatives are linked to sustainable development. For instance, if two places have very similar conditions in terms of economic, social, and cultural aspects, and at the same time are highly vulnerable to earthquakes, the best practice on housing safety of one place can be shared to the other place or vice versa. In UNCRD we are introducing and disseminating information of best practices from one country to another. Again, this effort is linked to sustainable development.

Why the focus on housing safety? Poor housing is the major cause of the loss of lives during earthquakes. According to Coburn, about 75 percent of fatalities that are attributed to earthquakes in this century were caused by the collapse of buildings that were not adequately designed for earthquake resistance, were built with inadequate materials, or were poorly constructed. We can observe in earthquake-prone countries that most housing conditions are poor because of poverty. Faced with these realities, what can we do?

UNCRD has several initiatives on earthquake safe housing. Before I discuss the specific initiatives, let me introduce the general approach and action that UNCRD is adapting to promote these initiatives. As regard to the approach, UNCRD introduces model technology as well as facilitate its dissemination. We analyze the problem using information gathered from the field survey of earthquake damaged areas and from the insights/experiences of other countries through the conduct of expert meetings. And we do advocacy such as urging the national and local government to adopt appropriate technology and to provide expert service. As regard to the action, UNCRD supports national institutions in the development of tools. For instance, we extend support to countries like Afghanistan, India, and Indonesia and provide training programs on

earthquake safe construction. We find good cases and disseminate them such as the CBDM initiatives of Nepal and the Philippines. We also administer wide scale dissemination of the importance and application of earthquake resistant constructions.

Since we are focusing our initiatives on housing safety, we tried to understand and put housing into proper context. In this regard, we look at housing in terms of the following contexts. First, what are the locally available materials to build houses? Second, what are the traditional knowledge and skill applied to build these houses? Third, how do culture and lifestyle play important role in these types of houses? We believe that the answers to these questions are crucial for designing and implementing housing safety initiatives.

In regard to these questions, a survey was conducted. Let me show you some photos of traditionally built houses and buildings. We will examine the building materials and how culture and lifestyle play an important role in these buildings.

This is a picture of unburned brick masonry. This is common in many parts of the world. It might protect the house from fire but collapsed during earthquake.

This one is a picture of stone buildings. This is common in Afghanistan. You can see from this photo how it performed during an earthquake.

This other photo is one of those many un-reinforced brick building in the cities of India. It is in the heart of the city, which poses great danger during earthquakes.

Now, see this one. These are reinforced concrete buildings. This type of construction has increased dramatically, where some say that there is a “new culture of RC buildings”.

Some also say that this type of construction is safe. Actually, these buildings were not yet fully evaluated in terms of its performance during

earthquake. This is another area that needs attention.

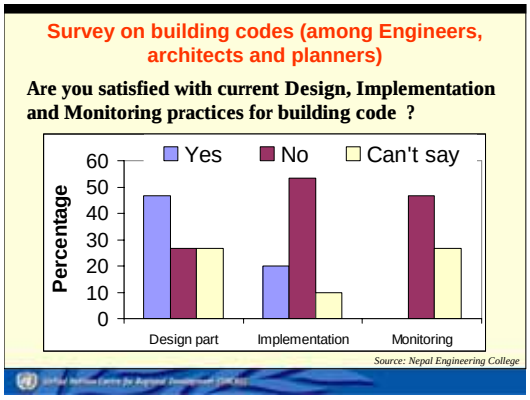
Here is a photo from Indonesia. It is the construction of a new building, which still uses traditional materials and neglects the use of new material. This is very recent construction.

We feel that as designers and implementers of this project on safe housing, we need to understand the reason and the culture behind this. In this next picture, you will see how the RC frame system is being misinterpreted. Obviously, this is another area of concern. We need to understand the context of the misinterpretation.

Here is another picture of a house that collapsed during earthquake. If you look in detail, this is a hybrid building. It comprises several materials such as brick, stone, concrete, and steel.

We have good reason to believe that there is something wrong in the construction process and the combination of materials are not properly done. Overall, these are the contexts in which we situate housing safety initiatives. These are some issues that UNCRD wants to address.

As regards the issue on building code dissemination and enforcement, let me show a result of the survey conducted by one of the universities in Nepal. The respondents of the survey include engineers, architects, and planners. I want to focus your attention to the graph. When the respondents were asked the question, "Are you satisfied with the current design, implementation, and monitoring practices of the code?", the responses are as follow: as regard to the design, only around 45 percent said yes; as regard to implementation, around 65 percent said they are not satisfied; and as regard to monitoring, around 50 percent said they are not satisfied and the rest reported that they could hardly say anything.

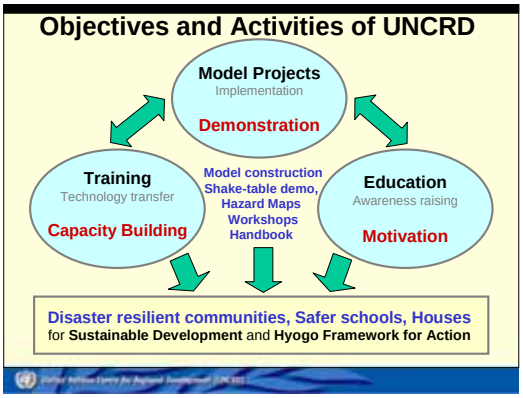


This result tells us that there is problem with regard to implementation and this could be another area that we need some form of advocacy.

We also asked this question, "Is devastation, damage, and loss inevitable?" We noticed that this question needs to be thought over. Many existing houses have inherent weakness in materials and in many places those modern construction technologies and implementation designs are not yet applicable or available. Thus, we can hardly prevent damage in these existing constructions. However, although we cannot prevent having damages, we can reduce the damages by making sure that the structures will not collapse.

How, then, can we promote this culture of housing safety? What I am showing here is a

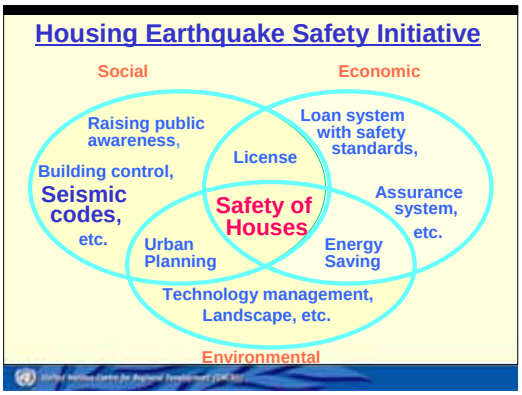
framework detailing the objectives and activities of UNCRD. In order to achieve disaster resilient communities and safer schools and houses, we adopted three major interrelated activities. These activities pertain to (1) demonstration of model projects – this activity is more on implementation part, for instance the administering of shake-table demonstration; (2) training and capacity building – this gives consideration to technology transfer such as the use of hazard maps; and (3) education and awareness training – for instance, we disseminate information and handbook to motivate people to adopt this culture of housing safety.



Why are we doing this? The reason is that we believe that simple solutions could work. In this picture you could see some initiatives that were done in Nepal.

They maximized the strength of good indigenous construction practices. This only proves that simple solutions could work. Demonstration model seems effective. However, we notice that in introducing model technology it must be accompanied with effective dissemination of tools.

Now let me introduce the Framework of Housing Earthquake Safety Initiative, or HESI.



As you see, our approach is holistic. We believe that in order to have safe houses, social, economic, and environmental factors must be considered. Having said this, HESI then is a sustainable way of making houses better and safer.

One component of HESI that we are proposing now is the Anti-seismic Building Code Dissemination or ABCD project. Among the objectives of this project include (1) evaluation of the former and current systems related to anti-seismic codes, (2) raising awareness of stakeholders, (3) developing effective and efficient policies on building code dissemination, and (4) building the capacities of local agencies. There are two interwoven issues that we need to address as far as building codes are concerned. First, the lack of building code compliance cannot be solved through enforcement action alone. Second, we are aware that there is a big difference of the quality of practices between the group of specialists/academics and the group of professionals/construction workers. So how do we address these issues? What we want to achieve in this ABCD project is to have a balance between control, which is the enforcement of the building codes, and engagement of people who are at stake. What we mean by this is that stakeholders must be engaged in training activities and demonstrations. At the same time, the stakeholders must understand and disseminate the code.

In conclusion, I would say that in order to make this culture of housing safety a reality, we need to persistently advocate, build, and count buildings with anti-seismic measures. It is in this regard that awareness and motivation concerning this culture of prevention is essential at the individual and community levels. We should remember this, preparation though education is less costly than learning through tragedy. Thank you very much.

VI. PANEL DISCUSSION

For Culture of Disaster Prevention

Kenji Okazaki, Professor, National Graduate Institute for Policy Studies

Panel Discussion "How to Create Culture of Disaster Prevention among Citizens"

Chairperson: Shoichi Ando, Coordinator, UNCRD Disaster Management Planning Hyogo Office

Panelists: Antonius Budiono
Isao Hayashi
Amod Dixit
Javier Pique del Poso
Kenji Okazaki

For Culture of Disaster Prevention

Kenji Okazaki
Professor
National Graduate Institute for Policy Studies

Good afternoon, ladies and gentlemen. My name is Kenji Okazaki from the National Graduate Institute for Policy Studies. I was the Coordinator of the United Nations Centre for Regional Development Disaster Management Planning Hyogo Office until last year. And I suppose that is the reason for being invited to speak at this event. Today, I'd like to present my views on what I believe are necessary to promote culture of disaster prevention. I hope that my presentation will encourage further discussion on the topic.

I'd like to start by bringing your attention to this table. It shows a list of natural disasters that occurred in the past 30 years, in the order of the scale of human casualties. Among these, earthquakes are in yellow.

Nation	Disaster	Year	Death
China	Earthquake	1976	290,000
Colombia	Volcano	1985	21,000
Armenia	Earthquake	1988	25,000
Iran	Earthquake	1990	35,000
Bangladesh	Cyc/flood	1991	140,000
Venezuela	Flood	1999	30,000
India	Earthquake	2001	20,000
Iran	Earthquake	2003	27,000
Indonesia, others	Eq/tsunami	2004	over 300,000
Pakistan	Earthquake	2005	over 80,000

As you see, earthquakes account for more than half of the 10 worst disasters. Therefore, it is obvious that there is a global need to reduce earthquake-induced disaster.

There are various types of houses in the world as shown in the earlier presentations. In Japan, the Great Hanshin-Awaji Earthquake demonstrated that traditional wooden houses are not entirely safe. Every time an earthquake occurs, experts regret why we couldn't make houses safer earlier. Even so, the same disaster occurs again and again, making me suspect that there might be a vicious cycle causing this trend to continue.

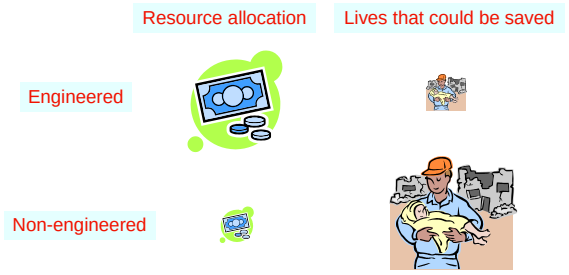
When a large scale disaster occurs, local and national governments as well as the international community provide assistance and, subsequently, the affected area recovers. But this post-disaster aid discourages retrofitting of houses by house owners prior to the disaster, leaving many unsafe houses intact, resulting in the increase of unsafe houses. As a result, more people die from earthquakes and more people must get involved in disaster recovery. This flow forms a vicious cycle.

Then, how can we change this cycle? One solution is that national and local governments as well as the international community commit to make houses safer and support such initiative. If the commitment for financial assistance is translated into action, I believe that incentives for safer houses would increase at individual, regional and national levels. The subsequent increase of safer houses would decrease the number of housing collapse and casualties during earthquake. This would decrease the cost of recovery, which can be used to reinforce existing houses, creating a positive cycle.

But in reality, there are a number of obstacles. An examination of allocation of

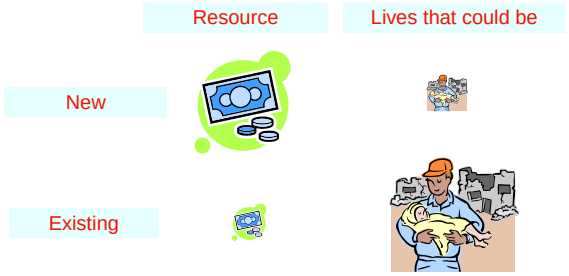
government resources, in terms of financial and human, for pre-disaster and post-disaster programs reveals that more resources are devoted to post-disaster recovery than to disaster prevention. They commit a large amount of financial and human support after a disaster. This is particularly true for the international community. Disaster prevention programs attract little attention. However, because emergency operations take place after a disaster when many lives have already been lost, only few lives can be saved. In contrast, the implementation of disaster preventative measures can potentially save many more lives. Hence, we must shift our resources from disaster recovery to disaster prevention. However, we continue to act in response to disasters.

Ineffective allocation of resources is also evident in building research. I have used the different terms of *engineered* and *non-engineered* to categorize buildings. Between these building types, much research is done on seismic resistance and isolation technologies of high rise buildings, but little research is done on conventional houses.



But because more than 90 percent of buildings in India and Nepal are non-engineered, over 80 percent of total building stock in the world is non-engineered. Because these unsafe buildings are occupied by humans, we cannot reduce disaster losses unless we improve the safety of these non-engineered buildings. However, they attract little attention and research funds.

Similarly, when spending habits for new and existing houses are compared, people tend to spend generously for new houses but not as much for the maintenance. However, many more lives can be saved by improving the safety of existing houses.



We can take an important step forward to create a culture of disaster prevention if resources are reallocated in the right direction. I believe that the most essential ingredient for a culture of disaster prevention is to understand risks of our own and families.

Another essential aspect is cost reduction. There are several ways to achieve this, for instance, technological development and government subsidies. It is also necessary to train masons and carpenters on available techniques.

The political commitment is also crucial. The reason is that many individual house owners would pay to reinforce their houses if they understand the need; but not all house owners would. Everybody dies eventually. Considering this, the probability of death from an earthquake, which chance of occurrence is 40 percent in every 30 years, might seem negligible. Just like the fact that many smokers wouldn't stop smoking even if they are told to do so, not all individual house owners would reinforce their houses.

On the other hand, governments are forced to make substantial financial commitment when an earthquake causes damage. In the case of the Great Hanshin-Awaji Earthquake, the government spent a large sum of public money to

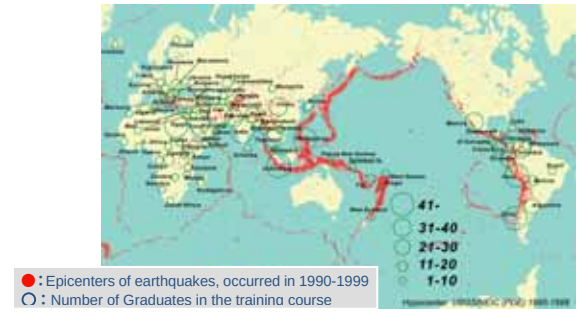
clean fallen roof tiles and to construct temporary shelters and public houses. In the end, more than 15 million yen was spent for every destroyed house. This amount is almost equal to the amount needed to build a new house. Massive economic losses and human fatalities could have been prevented if the fund was used to reinforce existing housing stock. Hence, the ultimate beneficiary of housing safety is the government and not house owners. Thus, the government should bear the ultimate responsibility because the way the tax money is allocated, which is decided by the government, is a critical determinant of the fate of citizens.

On the other hand, the key ingredient in promoting culture of disaster prevention is strengthening individual capacity to manage disaster. In this sense, risk communication is very important. This notion also applies to environmental problems, and it is important for every community member to understand disaster risks through mutual communication and learning instead of one-way communication from experts to non-experts. In this shared process, trust can be created and leadership can be established through participatory decision-making. We can expect positive effects from identifying owners of policies. And concurrently, individual disaster management capacity can be strengthened.

Like many disaster management projects that have been introduced, the United Nations Centre for Regional Development published a guideline based on case studies to promote disaster prevention at the community level. One of UCNRD projects, Community-Based Disaster Management, was successful in that it encouraged communities' own initiatives to plan and formulate policies for disaster prevention.

I would also like to mention an important role education can play. First of all, it is necessary to teach people about their own risks. Second, it is also necessary to train policy experts from government research agencies in order to develop effective policies. And I would like to emphasize the third, which is to raise experts who can transfer technical knowledge to the general public using easy-to-understand language. There is a significant divide between technical knowledge of experts and general knowledge held by the public and bridging the two has been the greatest challenge, yet is the most important.

Finally, it might sound like a personal advertisement, but my policy research institute offers an earthquake risk management program in collaboration with the Building Research Institute and Japan International Cooperation Agency. It is a Master's degree program designed to train researchers and government officials from developing countries for a year. This program was long offered as a JICA training program at the Civil Engineering Research Laboratory and turned into a Master program. As this map shows, the number of graduates has exceeded 1,200 and students come from various seismic countries.



We hope to take advantage of this network and continue to take disaster management initiatives on a global scale. Also, we hope to raise experts who can effectively communicate with the public.

This is the end of my speech. Thank you very much for your attention.

Panel Discussion "How to Create Culture of Disaster Prevention among Citizens"

Chairperson:
Shoichi Ando
Coordinator
UNCRD Hyogo Office

Panelists:
Antonius Budiono
Isao Hayashi
Amod Dixit
Javier Pique del Poso
Kenji Okazaki

Ando
Panelists include 4 case study presenters and Professor Okazaki. First, I would like to ask each panelist for a 3 minute comment on the case studies and the presentation by Professor Okazaki. First, I would like to ask Mr. Budiono for his comment.

Budiono
Thank you very much, Mr. Chairman. I feel happy to attend this session because I can learn a lot of things from my colleagues and Japanese presenters. In my view, Indonesia has high disaster risk because many buildings constructed in Indonesia are not safe. We can hopefully share our knowledge and information in this session so that we can develop our regulations, standards and safe communities in Indonesia and other countries. Thank you.

Ando
Thank you. Next, Professor Hayashi, please give your comment.

Hayashi
Many of today's presentations introduced community-based disaster management initiatives and how to create a culture of disaster prevention from these initiatives. This transformation is essential. Everyone is aware of the importance of seismic retrofitting of their houses and the availability of technology. But the fact that the practice hasn't spread widely among public makes me question the level of people's awareness and the status of disaster management in our daily lives.

One solution could be, like Professor Okazaki discussed, the creation of an incentive system supported by government financial assistance. Another important solution is to create and attach an image of modernity and fashionableness to disaster management.

Effectiveness of the latter point is obvious if we think about environmental issues. The subject has widely been covered by the media for the past 10 to 20 years, and individuals, communities and schools have taken many initiatives to tackle environmental problems. Certainly, it is important for all of us to be aware of the problems surrounding the environment. At the same time, it is noteworthy that the act of addressing environmental problems has come to embrace a sense of fashionableness over time through various intermediary sources. Paving the way for a similar development in disaster management arena is difficult. But this fact gives an important clue and we should make use of it.

Ando
Thank you very much. Next speaker, Mr. Dixit, please give us your comment.

Dixit
Thank you very much.
We have had the science and engineering, and the technology for several decades. Still it did not go out to reach the public, and to make this culture, as Professor Okazaki talked about, redefining, reinterpreting the cycle of earthquake processes, he proposed one. He also put new idea about the way resources have been allocated. And he proposed new allocation measures. So, I agree to him, and now heard the solution that we should be smart enough to catch the moment that was presented by the environment and translate that into disaster safety. That's also a good idea.

It seems that it is necessary to redefine the approaches, become stronger in our belief, and use that in all of our efforts. This is also necessary for demystifying science and engineering. So far, the science and engineering technology was mystic to use, and didn't reach down. It has to be demystified. We recognize the problem, and other people are suffering. Collective recognition and collective solution is required.

One of the most illuminating things that I heard this afternoon is from Professor Otani. "Who can provide earthquake safety to your house?" And he said, "Nobody, except you". So, to achieve that, this new definition, new approaches are needed, and there should be a change in hearts and minds. And that should be for everybody.

Last point, we have to be smart. This is a battle that we cannot lose. And it has to be very smart. And we have to look at the opportunity. I see that, especially in developing countries, the situation just after a disaster is the time when people talk about millions. And then we have to be smart to translate that opportunity and use that for diverting things into mitigation. That is the hard lesson I learned from Pakistan.

Ando
Thank you very much. Our last comment is from Professor Pique, please.

Pique
Thank you. Well, I have several aspects that I'd like to point out. We know that there's a high correlation with poor location and higher damage. So urban control on where you can build a construction should be an important issue also, not only for earthquake protection, but also for other disasters. In my country, it happens that many people are in the path of these avalanche flows. The avalanche flow is going to come through there and they've settled there. It just never gets controlled. You can't allow that to happen, otherwise later you will have to assist people. So that's really a problem that needs to be addressed, and whoever exercises urban control, our authorities need to make them aware of that.

I agree with everyone, that people's awareness is essential to do this. It becomes also an issue, the fact that non engineering construction, which is the largest number, is occupied by low income people. They really cannot invest money in improving the safety of their houses. There should be some kind of an incentive to do that, because we all know that, and I guess Professor Okazaki has made it very clear, the resource allocation for prevention is much lower than the money you have to spend to rebuild. So I think there is a very important point that has to be emphasized every time possible. It's much cheaper to invest money in prevention than in rebuilding, so you need to help these people who live in non-engineered houses to improve their houses. It would be cheaper to do that than it would be to help them to rebuild their houses.

And finally, I think the technology transfer is still an issue. In Peru, we have 28 engineering faculties teaching civil engineering. There are lots of engineers, they all learn seismic engineering and all that, but there's still some technology improvement that can be done. We have been learning from the last revision of our standards, that there are still some systems that are safer, some systems that may collapse. And so there is some room to teach engineers who will be in charge of design or construction, to have the tools to do that. But that doesn't go along with the awareness of people. I mean, if people do not implement that technology there will be this

vicious circle that Professor Okazaki presented to us. Thank you.

Ando
Thank you very much. Taking into consideration the comments given by 4 case study presenters, Professor Okazaki, please give us your comment.

Okazaki
Since Professor Hayashi mentioned the environment, I would like to cite the subject in my comment. I think that the two subjects, disaster management and environment, share similarities. On the one hand, environmental problems pose negative impacts upon the natural environment because of human activities that are dependent on the use of scientific technology. On the other hand, disasters pose negative impacts upon human society due to natural events. The two are at opposite ends of a spectrum but are fundamentally the same.

In the environmental sphere, NGOs play a central role, which raises a question of why disaster management does not attract the same degree of citizens' participation. One explanation could be uneven distribution of risks. Risks created by environmental problems are shared evenly—however, disaster risks are shared unevenly. Both rich and poor are placed under same risks created by environmental challenges, so risk communication is much easier. But this is not the case for disaster risks. Ignorance created by this uneven distribution of risks is a hurdle we have to overcome as we continue to strive for disaster prevention.

Ando
Thank you very much. Today's discussion theme is "How to create a culture of disaster prevention among citizens". Although it is a very broad theme, the key point raised in two keynote speeches and comments just given, seems to be "Who is the principal actor and who should act". Who is the stakeholder? Considering the title of Professor Otani's keynote address, "Who can upgrade the seismic safety of our houses?" The key question might be "Who is responsible for creating a culture of disaster prevention?"

As Professor Hayashi discussed, there are three key elements in disaster prevention: self-support, mutual help, and public assistance. Self help places responsibility on individuals, mutual help on communities, and public assistance on governments. Since Professor Otani expressed his hope for governments' role in the end of his presentation, I'd like to ask the panelists who they think should bear the primary responsibility. I'd like to follow the order of the earlier comments so Mr. Budiono, please.

Budiono
Thank you, Mr. Ando. Who is the main player in earthquake disaster prevention? Of course, all of us and one of them is the government. The government is responsible to regulate and control the building construction and disseminate the regulations and standards to the communities. It also has to distribute resources to help people build their own houses. So they have to know how to construct safe houses. And the other is professionals such as architects and engineers. They have a very important responsibility in design and housing and building construction. In this sense, we all have a role in earthquake disaster management. Thank you.

Ando
Thank you very much. Mr. Hayashi, please.

Hayashi
I feel pressured to answer that every one of us has a role. But the important point is that every community should come up with its own way of combining the three elements of disaster management (self help, mutual assistance and public aid). Each community, and not the national government, has to develop suitable initiatives and processes to create a culture of disaster prevention. This is because each country is unique in terms of ethnic and religious compositions and other factors.

Ando
Thank you very much. Mr. Dixit, please.

Dixit
Actually, the field of action gives responsibility to nations to take care of disaster management, and since making of the culture, or creating culture is also one of the aspects of disaster

management. So that will be, perhaps, the responsibility of the nation, and which is interpreted, especially in developing countries, as the government. And if you give the task of creating culture to the government, then you are more certain you are not going to succeed very much and you are not going to make a very long mile. So these are the controversial sort of thinking that came to my head while thinking. Then I remember what Professor Okazaki said, that the risk from disaster, the disaster risks, are individuals. And the carriers of culture are ultimately the individuals, and it goes to community. So that's how I see. It should start from individuals, the champions, the social transformers. And I see some faces, many of them are familiar to us and these are the people who made this culture. So it has to start from those champions.

There is one thing I'd like to emphasize about the community. The world is changing and even the World Bank and Asian Development Bank are now talking about risk reduction. They didn't five years ago so this is an opportunity and time for us to change our mindset. That demands that all stakeholders should be involved in creating this culture of safety. Thank you.

Ando
Thank you. Professor Pique, please.

Pique
A few years ago, Professor Kuroiwa, who was the first Director of CISMID (Japan-Peru Center for Seismic Research and Disaster Mitigation) at my university, started to promote the training of school teachers. He prepared a booklet. The strategy was to sing an agreement with the Ministry of Education to train teachers so they could train children. If all the people are involved, then you are lost because there's nothing you can do with all the people. But with children, since they are small, it can be done through their teachers. It could take generations, but hope there won't be another earthquake for a generation and we'll be better off. I'm glad that you decided to invite high school students here as to make them aware that because I think this is the only long-term solution. To train teachers, and through teachers train children, then you have a new culture in 10, 15 years or maybe longer.

Also, investment projects that are financed by World Bank or Inter American Bank now require prevention of natural disasters. If you don't have that component, they won't give you the money. And that is a really good alternative. If you want to build a new school, well, is there a risk for disaster? You make that investment and you start protecting little by little through education and through new investment considering these factors and we'll be better off. Thank you.

Okazaki
Compared to environmental problems that are shared globally, disaster is a local phenomenon. Disasters reflect unique conditions such as geographic and soil characteristics, lifestyles and income levels, so disaster management should be promoted locally. In this context, I believe that communities should take the lead in creating a culture of disaster prevention.

Among community members, NGOs should play a major role. NGOs, like NSET headed by Amod, have knowledge on the local conditions and expertise in the area they are specialized in. So NGOs can be vital players.

In the meantime, it costs money to create and promote cultural values. And I believe that the money should be financed by governments, which are the prime beneficiary of safer communities. Governments should assist NGO activities as well as retrofitting of houses. Such efforts by governments will, in the end, save human lives and decrease government spending in the event of a disaster.

Ando
Thank you very much. As Mr. Budiono and Professor Hayashi pointed out, requirements for the leadership depend on divergent characteristics of communities, society and culture. In the meantime, it seems necessary to advance disaster management agenda through collaboration of representatives from governments, academia, communities and NGOs.

Now, I have received two questions from the audience. One question is from a graduate student

to Mr. Budiono. He went to Yogyarka in Indonesia last August and was surprised to discover many people still living in camps three months after the earthquake. By interviewing those who were living in the temporary shelter, he learned that they had no knowledge on disaster prevention and seismic resistance requirements for buildings prior to the earthquake. His question is whether Indonesia has begun disaster education since the earthquake disaster.

Budiono
Thank you. Of course, as I mentioned before, most of Indonesian territory is at a high earthquake risk. That's why every year, we send government officials around Indonesia and disseminate information to local governments. And together with experts, they provide education to communities.

After the earthquake, we built more than 10,000 houses out of the total of more than 200,000 houses that collapsed in Yogya in Central Java. Because of this experience, we tried to make simple guidelines to the community and then distribute to all Indonesian people in community through the local governments. Starting this year, we are trying to make similar but better guideline to the community.

Ando
I hope it will be successful. Another question is from someone who has professional knowledge in housing construction. The question concerns culture but is a little technical. It is addressed to Professor Otani. His opinion is that the Japanese tradition of timber house construction seems to have avoided nuki technique, but the technique might actually be earthquake resistant. He does not intend to deny modern technology, but he is interested in knowing Professor Otani's view on whether there is a way to merge traditional housing construction techniques with modern technology.

Otani
I mentioned that buildings that were built with new technology didn't suffer any damage, showing a picture of a pre-fabricated house. Most houses in Japanese countryside were of traditional type having tiled roofs 100 years ago. In contrast, most of them are now pre-fabricated houses. I question whether we should embrace this transformation. It is clear that pre-fabricated houses make summer feel cooler while ensuring safety in the event of an earthquake. But I feel that our culture is fading.

The term civilization might be more suitable than the term culture, but currently, renewed attention has been paid to the traditional wooden structure in an attempt to reconsider Japan's traditional housing techniques. Today's presentations introduced a wide range of initiatives to improve housing safety in different counties. In 2005, there was a severe earthquake in an ancient city in Iran, which completely destroyed many buildings as well as a fortress made with clay, all of which were valuable enough to be designated as UNESCO heritage. At the same time, buildings built with reinforced concrete in the same region suffered just minor damage. Then, should we stop the use of clay for building construction and replace it with reinforced concrete? If we do it, we will lose culture that we have long cherished.

Importantly, it would not be feasible to replace all unsafe buildings in the world with safer reinforced concrete buildings because we don't have enough resources left. Therefore, we have no choice but to try to develop safe building technology that uses available materials and existing traditional techniques. As for environmental problems, we must come up with solutions while keeping in mind what the problems are. Simple adaptation of new technology or introduction of steel frames and reinforced concrete would not necessarily be the most effective solution. Mr. Murty posed a question on whether it would be possible to improve housing safety in the third group of countries by transferring Japanese technology. Unfortunately, even if Japanese timber house construction techniques such as nuki and sashi techniques are introduced in Indonesia, for example, there might not be facilitating technology or materials in the country. Instead, I believe that utilizing locally available materials and techniques is more important in an effort to improve earthquake resistance of houses.

Ando
Thank you very much. Professor Otani was not a panelist but his conclusion seems an appropriate statement to conclude today's symposium. I'd like to take more questions, but because of time constraints, I just introduced questions that were received in advance. I would like to end the panel discussion now. Thank you very much.

VII. APPENDIX

The Daily Yomiuri article (1 February 2007)

Building a culture of disaster prevention

Symposium in Kobe stresses importance of community awareness and financial subsidies

By Hiroko Ihara
Daily Yomiuri Staff Writer

KOBE—To help prevent and mitigate earthquake damage, it is vital to educate the public about safe housing, according to an international symposium, titled "Culture of Disaster Prevention in the Context of Housing and Urbanization," held last month in Kobe.

The United Nations Center for Regional Development, The Yomiuri Shimbun, Osaka, the Hyogo prefectural and Kobe municipal governments and others held the event on the day after the 12th anniversary of the 1995 Great Hanshin Earthquake to pass on to the world the lessons learned from the disaster that killed 6,434 people.

About 200 people attended the event held at the Yomiuri Kobe Hall in Chuo Ward.

Opening the event, Kazunobu Onogawa, director of the UNCRD, said, "To promote disaster prevention globally, we must increase community awareness until it becomes ingrained in the culture of each locality."

Hyogo Vice Gov. Tomio Saito followed by saying, "We learned from the quake that to protect human life, we must make existing houses more quake-resistant and build quake-proof houses. It's more effective than just implementing disaster prevention schemes, such as building a disaster prevention center."

Shoichi Oikawa, president of The Yomiuri Shimbun, Osaka, said: "At a time when many children don't remember the 1995 quake, the media need to inform the public on how to cope with future quakes. It could greatly minimize damage."

The discussion panel comprised Prof. Kenji Okazaki of the National Graduate Institute for Policy Studies in Japan; Antonius Budiono, director of Directorate of Building and Neighborhood Development in Indonesia; Isao Hayashi, an associate professor of the National Museum of Ethnology in Japan; Amod Dixit, executive director of the National Society for Earthquake Technology in Nepal; and Prof. Javier Pique of the National University of Engineering in Peru. It was coordinated by Shoichi Ando, coordinator of the UNCRD Disaster Management Planning Hyogo Office.

Following are excerpts from their discussion.

Okazaki: Both governments and individuals need to commit to safe housing. For governments, the more that houses are reinforced, the less they'll have to pay in reconstruction costs and the more they can invest in safe housing. In this regard, political commitment is vital.

The hurdle for disaster prevention—unlike environmental preservation—is the difficulty in activating efforts in the field and sharing disaster risks globally due to poverty and other factors.

Hayashi: Making seismic-resistant buildings and houses is necessary, and there are techniques to do so. We need to think about why this hasn't been promoted and also need to think about what economic and other forms of support are necessary.

To create a culture where seismic-resistance is a matter of course, we need to create an image that's appealing and sophisticated, like efforts to preserve the environment.

Dixit: Who can provide seismic safety for your house? Nobody but you. You need to change your heart and mind. Also, we have to be smart. Developing countries in particular should go ahead with these measures.

Pique: Many non-quake resistant houses are occupied by low-income families. So governments need to provide some kind of [quake-proofing] incentives.

In my country, it's important to transfer technology by training engineers at 28 universities with faculties of civil engineering, which will reduce expenses for rebuilding damaged houses.

Ando: But who should build the culture of disaster prevention?

Budiono: All of us. But also the governments. They're responsible for regulating and controlling the construction of safe houses and distributing resources.

Dixit: Creating the culture is the responsibility of the government in the first place in developing countries. It has a long way to go because it must encourage the various parties involved.

All stakeholders should be involved, but each community needs strong leaders to create and spread the culture throughout their communities.

Pique: Three years ago, my country began training teachers to provide disaster prevention education to students. Educational authorities need to educate all teachers to spread the knowledge to students. It's a long-term solution, but this kind of investment can better implement building the culture.

Okazaki: Local measures are necessary to cope with disaster damage, and therefore each community should play a central role.

The involvement of nongovernmental organizations, like environmental organizations, is also important. Although it can be costly, spreading the culture of disaster preparedness benefits governments in the long run.

Hayashi: There's no uniform answer to the question because each issue is different.

Ando: I agree. Who takes the lead depends on each area. It's necessary for governments, experts and nongovernmental organizations to coordinate with each other.

The Yomiuri Shimbun

Panelists at an international symposium held in Kobe last month discuss the importance of building a culture of disaster prevention in each community.

Difficulties in increasing awareness

In the presentation prior to the panel discussion, five experts from Indonesia, Japan, Nepal and Peru spoke about various efforts to develop safer housing in their countries.

According to Antonius Budiono from Indonesia, the country's 450 local governments each have a building permit system, but many buildings do not meet the quake-resistance standard and building standard. Indonesia was hit by three major earthquakes over the last three years, killing thousands each time. Many buildings in Aceh and Yogyakarta that did not meet the standards also collapsed. The Indonesian central government set up the Building Law for the first time in 2002 to review and improve all regulations and standards related to construction. The government is providing financial support to all the local governments to have their own local building acts by 2010.

Based on his fieldwork, Isao Hayashi spoke on community initiatives for disaster reduction in Kushimotocho, Wakayama Prefecture, which suffered a major quake in 1946, to prepare for a highly probable Nankai earthquake and subsequent tsunami. Introducing the efforts of local residents, such as designating escape routes at their own expense, Hayashi said, "Governments also need to support their efforts."

Amod Dixit of Nepal said that due to the country's economic situation, developing human resources and reinforcing current buildings built with brick, stone and rough concrete are not even being considered.

He said, "People believe earthquakes are an act of god, and they cannot do much about it...Although experts have knowledge and technology, they've not been able to provide it to working-level people because they don't understand the suffering of the citizens."

According to Javier Pique from Peru, traditional buildings in his country are made of local materials. Although buildings made of adobe or mud are likely to suffer severe damage in quakes, their seismic resistance can be strengthened by reinforcing the corners vertically, using such locally available materials as timber, twigs and rice bags.

Bishnu Pandey, a researcher from Nepal at the UNCRD Disaster Management Planning Hyogo Office, said that the UNCRD has promoted the seismic reinforcement of houses to each government after surveying the types of houses in each country and their weaknesses.

DVD promotes disaster mitigation education

Prior to the presentation by the five experts, Taisuke Matsuzaki, a National Institute of Multimedia Education researcher, made a multimedia presentation on disaster mitigation education that was first given after the 1995 quake at schools in Kobe. He introduced a DVD for middle school students jointly made by The Yomiuri Shimbun, Osaka, YTV and the Kobe Municipal Board of Education in March, containing video and newspaper articles.

According to Matsuzaki, the DVD has been used at schools and universities across Japan. Armenia and Algeria, which were hit by major earthquakes in 1988 and 2003, respectively, are also considering using it.

Urgent need for safe housing

By C.V.R. Murty
Editor in chief of World Housing Encyclopedia

It is said that it's not earthquakes that kill people, but buildings that kill people. We need to do something to prevent people across the world from dying just because houses and buildings are collapsing.

Communities worldwide can be classified into three groups: Group 1, countries with laws to regulate housing and construction; Group 2, countries with the knowledge of what needs to be done but without the collective wisdom or resources to implement the systems; and Group 3, countries that are in the dark and don't realize that housing is a key factor in saving lives.

The latter two groups need to be supported through a global initiative by the United Nations Center for Regional Development and other organizations aimed at reducing earthquake death tolls.

In India, 60 percent of the country faces the threat of moderate to severe earthquakes. However, earthquake safety is not taught in any undergraduate college. We face acute shortages of safe housing in urban areas and are without the regulatory bodies and resources necessary to bring safe housing to our communities.


C.V.R. Murty

Over the last seven years, experts worldwide have built the World Housing Encyclopedia, an Internet database of housing construction types in quake-prone areas across the world, to share safe-housing technology. It's important to build a global network that can bring this technology into the areas where it's needed.

Education is the most powerful tool to wake up the world to the danger.

A solution: using tax money

By Shunsuke Otani
Former president of Japan Association of Earthquake Engineers

The 1995 Great Hanshin Earthquake caused about ¥10 trillion in losses, and 60 percent of which is said to have been caused by collapsing buildings.

Of the quake's 6,434 victims, 5,500 people died immediately after it struck. Of these, 87.9 percent were killed by collapsing structures.

Many traditional houses are thatched—the tiles are fixed with clay to the roofs—and in the quake, these heavy materials collapsed the houses. The [roofing] method was invented by our ancestors for living comfortably in the hot summer as the roof tiles and clay provided insulation and prevented the roofs from blowing away in typhoons. But unfortunately they collapse in major quakes, which have occurred only every 400 years or so [in the Kobe area].

New wooden houses are comfortably air-conditioned and have much lighter roofs designed to withstand typhoons.

They're also built with techniques to minimize quake damage. Due to a 1981 revision of the Building Standards Law, stipulating new quake-resistant designs, buildings constructed under the revised law are much sturdier than those built earlier.


Shunsuke Otani

We have a technique here in Japan for protecting structures. So we should buy and use it. It's like a cell phone: You can't enjoy its convenience unless you buy one and use it. The techniques will not be fully used until people think of it as their own financial responsibility. One solution is to ask politicians to use tax money to provide seismic reinforcement.

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