

# External Evaluation of DPRI, Kyoto University

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## **Introduction**

It was a great honor and pleasure to visit DRPI and participate in this evaluation. The two day External Evaluation Meeting (14-15 January 2004) was lively and informative. The meeting was very well prepared and supported. The entire DPRI management, professional, and support staff are to be congratulated for organizing such a thorough, smooth-running, and effective evaluation process.

## **Executive Summary**

1. The quality of the research at DPRI is world class.
2. In common with other world class research institutions, DPRI faces the challenge of more effectively ensuring that its research becomes the basis for real changes in the world – changes that result in reduced loss from disasters.
3. DPRI could work to improve up take and implementation based on its research by establishing a “Public Relations” office, offering short training courses for a variety of professionals including journalists, bankers, construction company executives, collaborating with Hyogo Prefecture officials in establishing a new Earth Science Museum.
4. DPRI also faces some strategic decisions concerning its role in Japan and the world. In order to consolidate its position as a world leader in disaster research it needs to expand the number its foreign student and researchers, use English more as a working language, and publish more in English.
5. DPRI’s position of world leadership could also be strengthened by widening the scope of its involvement in research capacity building in the least developed countries of the world (in collaboration with JICA and international agencies).
6. A significant window of opportunity for consolidation of DPRI’s world leadership is opening up with the planning of the World Conference on Disaster Reduction, to be held in Kobe in January 2005. DPRI should seek to have a role in this meeting and in the implementation of the Program of Action (2005-2015) that will result.

7. The two mutually complementary and interactive functions of the IMDR and DRS need to be maintained and strengthened. I believe that together the IMDR and DRS provide an excellent platform within the DPRI for developing further the social and human science components of disaster risk management.
8. The financial base for DPRI's work, given its change to an independent research institute, could be strengthened in a number of ways including offering a fee-based international Masters course in integrated disaster risk management, providing fee-based short courses for professionals, providing fee-based deluxe executive briefings in the elegant surroundings provided by Kyoto for top corporate executives.
9. In order to ensure the sustainability of DPRI's quality research, beyond financial stability, there need to be additional efforts in open recruitment, mentoring and encouragement of young researchers, and aggressive recruitment of women researchers.

### **Terms of Reference**

The external evaluators were given four tasks:

1. Evaluate, advise, and provide opinions and suggestions regarding DPRI's self-assessment of its achievements in the past 5 years with respect to the 1998 external evaluators' recommendations.
2. Provide comments and advice on DPRI's future vision, perspectives, and priorities.
3. Express opinions and views related to DPRI's expected roles and functions (such as the role of "All Japan Research Collaboration Center", international research network core center, etc.) and suggest strategies for developing linkages, support, and collaboration with external organizations.
4. In addition to these three items, any advice or suggestions that contribute to the betterment of DPRI are very welcome.

### **Comments Concerning DPRI's Self-Assessment**

**G-1-1:** I have no doubt that each of the DPRI's centers and divisions have strong and clear research orientations. My question at this point is whether it would be beneficial for the entire DPRI to move to the next level by initiating an internal process of sharing and discussing assumptions and definitions that underlie their "research orientation". Such discussions might focus on such questions as "What is a disaster?", "What is causation?", "What is the nature of complexity?" These kinds of "meta" questions, if discussed, could move the entire DPRI toward better cooperation across centers and divisions as well as reveal elements of a common research framework.

**G-1-2:** There is already evidence of cooperative research and interaction amongst different divisions, centers, and sections in DPRI. This could be strengthened, however. The first way would involve the kind of discussions described under G-1-1. Another, complementary, way would be for a number of relevant divisions, centers, and sections to focus on the same practical problem such as all aspects of the possible future Tonankai earthquake (predication, public education and warning, loss mitigation, public policy, recovery planning, etc.). To some extent this approach is already in evidence at DPRI, but it could be strengthened.

**G-1-3:** During my limited exposure to DPRI (July 2003 and during the External Evaluation Meeting), I have been impressed at the way that junior professionals speak up in discussions and the overall atmosphere of mentoring, as well as courtesy towards and appreciation of the support staff. “Internal hierarchy” has its place but must be used to release the creativity of younger professionals and support staff. I believe progress has been made in this area, especially in relation to other Japanese institutions with which I am familiar.

**G-1-4:** Although there are robust linkages with engineering, informatics, and science departments at the main campus of Kyoto University, I would suggest exploring links with medicine (especially gerontology and emergency medicine), public health, social work, law, and public administration. These are all academic areas that could benefit from their students better appreciating the complexities and potentials of disaster risk management. They are also academic areas that are likely to provide the DPRI with additional human resources and insight into subject areas that are required for a comprehensive and integrated approach to disaster risk management.

**G-2-1:** While the IMDR and DRS do seem to overlap to some degree, they cooperate well and complement each other with strengths. Recent cross-appointments between IMDR and DRS will make these complementarities even stronger. In the broadest (somewhat over simplified) terms, one could say that IMDR’s strengths are in socio-economic systems modeling and on the study of direct losses and how to reduce them; whilst the DRS’s strengths lie in the areas of sociology and social psychology and the study of indirect losses (including the social costs of recovery) and how to reduce these costs. I do not believe that anything would be gained by merging them into one center as they. On the contrary a merger would be disruptive at a time when IMDR and DRS should be focusing their attention on maximizing their cooperation. For example, having studied the recovery process in Kobe, the DRS is in a position to provide the IMDR insight that will assist the latter in pursuing its work in Nagoya on mitigating the future impacts of the Tonankai earthquake.

Therefore my own advice on this matter is that these two mutually complementary and interactive functions need to be maintained and strengthened. I believe that together the IMDR and DRS provide an excellent platform within the DPRI for developing further the social and human science components of disaster risk management. In particular, I believe that an important priority should be to develop better understanding of risk management in complex and multiple disaster risk scenarios and situations such as environmental disasters, industrial accidents and other technological disaster scenarios, and biological disasters. In this regard it is important to note that in its preliminary concept paper for the World Conference on Disaster Reduction (“Kobe 2005”), the UN Inter-governmental Secretariat for Disaster Risk Reduction (ISDR) includes not only natural hazards (the focus of the UN’s International Decade for Natural

Disaster Reduction), but also environmental, technological, and biological hazards. Increasingly, the management of disaster risk in complex, industrial societies is being addressed in more holistic ways. U.S. author, Marc Reisner, took this approach in his recent book on California's earthquakes, which includes study of how California's water resource management, industrial land use, farming, and urbanization interact to produce a situation in which a large earthquake such as 1906 in San Francisco or 1857 in Los Angeles would result in "[d]eath and suffering, breakdown and paralysis ... like nothing we've ever seen".<sup>1</sup>

**G-2-2:** No comment

**G-3-1:** Further development of comprehensive and integrated research approaches can and should be pursued. I don't see these as separate "research areas" but more as cross cutting approaches that can strengthen the work of the whole DPRI. There are two aspects of "comprehensive and integrated" that could benefit from further effort. First, more attention could be given to the underlying (root) causes of disaster vulnerability (exposure and potential loss) and the implications of these for public policy. I have in mind underlying political economic causes.<sup>2</sup> Secondly, considerable benefit for the whole DRPI could come from additional work on what accounts for successful implementation and application of the scientific knowledge generated by an institute like DPRI. Why does some scientific knowledge translate into changes in design, land use, warning systems, etc. and some does not? It is perhaps not an overstatement to say that the development of Implementation Science is required in order to maximize the benefits to Japanese and global society of the scientific and engineering knowledge available now and in the future.<sup>3</sup>

**G-3-2:** Same comment as above under G-3-1.

**G-3-3:** Concerning environmental science research, some good work is already underway such as that concerning spread of toxic chemicals by flood waters. One additional contribution that environmental science could make would be concerning the health and agricultural/ livestock/ fisheries consequences of global climate change in selected parts of the world – perhaps in cooperation with the Division of Atmospheric Disaster. Another potential area would be to consider the biological (organic as opposed to inorganic) contamination of soil, air, and water in possible future hazard events, especially the public health consequences of such a combination of events as a flood or earthquake that happens at the time of a major livestock health crisis such as avian flu.

**R-1-1/ R-1-3:** The publication record in English language journals is substantial but mixed. Additional attention to English language publication would benefit the DPRI and the rest of the world. In addition, where appropriate funds and facilities should be sought out to make sure that

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<sup>1</sup> Marc Reisner, *A Dangerous Place: California's Unsettling Fate*. New York: Pantheon Books, 2003, p. 6.

<sup>2</sup> "Root causes" as addressed, for example, in Ben Wisner et al., *At Risk: Natural Hazards, People's Vulnerability and Disasters*. 2<sup>nd</sup> Edition. London: Routledge, 2003.

<sup>3</sup> The UNISDR is proposing a series of very concrete targets as part of the Plan of Action for the World Conference on Disaster Risk Reduction ("Kobe 2005"). The science and engineering necessary for achieving these targets already exists, but the challenge will be to understand how to overcome obstacles to IMPLEMENTATION.

selected reports are translated into locally useful languages such as Chinese, Indonesian, and Spanish. It could be that a new central “Public Relations” office for the whole DPRI could maintain, among its other functions, a data base on sources of funding and technical competence for such translations projects. Which leads me to the next item in the summary of the Self-Assessment.

**R-2:** The question of evaluation of individual performance is a difficult and delicate one. Above all, one wants to provide clear incentives for people to do high quality research. At same time, as I have noted earlier, it is also important for the DPRI to be proactive in getting this research utilized. However, researchers are not generally trained in extension, communication, and application. Thus I would be careful about how one phased in evaluation based, in part, on “contributions to the public”. It could be that a central DPRI unit focused on “Public Relations” should be available to all researchers as a resource for finding ways to ensure better uptake and utilization of research results by a diverse set of actors: government officials, corporations, NPOs, media, etc.

**C-1/ C-2:** I have not studied the budget in detail, but given the importance of these two items and the fact that the self-assessment concludes that they have “improved to some extent” (as opposed to “satisfactorily”), I feel that more effort is needed. Young researchers are definitely to be supported and mentored. This is also one of the keys to easing the intensity of the “internal hierarchy” mentioned earlier (see G-1-3).

**C-3:** “Insufficient” improvement is noted by the self-assessment in the area of leaving young researchers “relatively unburdened by administrative obligations”. I would have expected much more improvement in this area during the past five years, and I would strongly recommend that more effort be applied to this issue.

**E-1:** No comment.

**E-2-1:** The number of graduate students, foreign students, and postdoctoral fellows could increase (see a few related ideas below).

**E-2-2/ E-2-3:** I agree with another of the external evaluators who suggested that over time the DPRI moves to the situation in which all graduate seminars are conducted in English.

**E-2-4:** Part-time students are important because of their direct connection with the public and private sectors and hence the process of application and implementation of scientific research. An additional suggestion would be to mount a series of specialized short courses for various kinds of mid-level professionals – e.g. insurance company employees, journalists, and employees of construction companies. In other parts of the world (e.g. UK and USA) institutions of higher education are able to charge fees for such courses that often the employer pays. This would help to secure the DPRI’s fiscal stability while also helping to ensure implementation and application of its science and engineering research.

**E-3-1:** Yes, associate professors should be able to supervise PhD students.

**E-3-2/ E-3-3:** No, I see no advantage to DPRI's having its own graduate school. I think the status of a "university-affiliated research institute" gives the DPRI the best of two worlds – research and training.

**O-1:** No comment.

**O-2-1:** An administrative unit that supports foreign researchers would be a good thing.

**O-2-2:** I agree, as my prior comments suggest, that a central DPRI administrative section is needed to handle "Public Relations"; however, the ones highlighted under this item in the self-assessment ("technology transfer, licensing, patent issues") are too narrow. In addition, this office should handle, as I have suggested earlier, relations with the media and also facilitation of translation of reports into appropriate languages.

**O-2-3:** No opinion beyond the implications of creating administrative sections for foreign student affairs and public relations, as discussed above.

**O-3:** Sabbatical leaves for faculty are very, very important in ensuring their productivity!

**O-4-1:** Open recruitment is common in the best research institutions worldwide and is a very healthy thing.

**O-4-2:** Female researchers are still few and far between. I am encouraged by the fact that among the DPRI faculty with whom I spoke there were several who had identified female advanced undergraduates and Masters students whom they were hoping to attract to PhD study. This is a long, slow process, but hopefully by the next evaluation in another five years there will be, at least, some female assistant professors in the DRPI.

**O-5-1:** No comment.

**O-5-2:** Contracting might be useful; however, with contracting there is always the additional question of how to maintain quality control.

**S-1:** There is a good deal of reconsideration of DPRI's roles and duties as a government funded research institute going on (see next comments).

**S-2-1:** There is already a certain amount of collaboration with industry. I believe a balance should be struck between this kind of collaboration and links, as well, with local governments, NPOs, and international organizations (e.g. UNESCO). The model that seems to be assumed in this series of self-assessment items (S-2 ...) is of more specialized engineering research institutes as those dealing with chemical engineering, wood products, etc. These have natural and more or less exclusive links to industry. However, DPRI is different. Firstly, it is interdisciplinary. Secondly, its range of possible collaborators is much broader.

**S-2-2:** I don't think a Technology Transfer Center would be a good use of resources at this time (in part for the reasons just given in S-2-1); however, to some degree questions of technology

transfer could be handled by a multi-purpose administrative unit dedicated to “Public Relations”, as I have described earlier.

**S-2-3:** “Fostering disaster-prevention industries” could be a good thing, depending how the words “foster” and “industries” are defined. Firstly, it is probably beyond the scope of DPRI, even if it were empowered by Implementation Science, to take on the search for venture capital and the whole host of legal, financial, and marketing activities necessary to “foster” an industry. Secondly, much of the technology and design developed by DPRI belongs, properly, in the public domain – not private hands -- because of its critical nature in protecting lives and property. This is an ethical judgment on my part, but one I believe may be shared by many DPRI faculty members. Therefore my recommendation would be to seek out relationships with business school faculty and others who could take on the “fostering” function while also discussing, internally, such ethical issues as public access to inventions and designs.

**S-3-1:** Considerable progress has been made in the area of communicating DPRI related research to the public. The link between DPRI and the Kobe Memorial Museum and Institute is helpful in this regard and should, perhaps be strengthened. Might it not be possible to imagine as a further stage of the development of a cluster of disaster prevention related activities in Hyogo Prefecture that DPRI could partner with others to develop a separate Earth Science Museum that would instruct children and adults in the full range of hazards DPRI studies?

**S-3-2:** The number and range of extension lectures provided by DPRI faculty is impressive.

**S-3-3:** As I suggested earlier, training course for journalists and other media workers would be a valuable way to make contacts and to improve the accuracy of reporting on disasters.

**S-3-4:** I am pleased that the Institute has an “open house”, public day. Perhaps the public response to this would give some preliminary indication of how popular an Earth Science Museum would be.

**S-3-5:** No comment.

**S-3-6:** The present physical location and architectural arrangement of DPRI is not appropriate for a day-to-day public information center. DPRI’s web site could serve his function, however, and also, as I suggested above, DPRI could collaborate more with the Kobe Memorial Museum and explore the idea of a separate Earth Science Museum, possibly on another available plot of land in Hyogo Prefecture.

**S-4-1:** DPRI collaborative research in Indonesia and China, collaboration with the U.S. on research concerning urban earthquake, and DPRI involvement in regional and international studies (GAME, IHP, UNESCO cultural heritage) are all excellent. However, given the human resources at DPRI and the commitment of the Japanese government to helping humanity meet the Millennium Development Goals, more could be done. I have in mind especially attempts to build capacity in the least developed, highly indebted countries (HIPC countries). These include most African countries (where atmospheric hazards and floods are of great importance), many small island independent states, some Latin American countries such as Nicaragua, Guatemala, El Salvador, Honduras, and Bolivia, and some Asian countries including Cambodia and

Bangladesh.<sup>4</sup> Of course DPRI must avoid overextension and superficiality, however, needs for building indigenous research, analytical, and planning capacity in these countries is very great. Perhaps some kind of standing committee to liaise with JICA on priorities and needs should be established at DPRI.

### **DPRI's Future Vision, Perspectives, and Priorities**

The quality of the research at DPRI is world class. In common with other world class research institutions, DPRI faces the challenge of more effectively ensuring that its research becomes the basis for real changes in the world – changes that result in reduced loss from disasters. DPRI could work to improve uptake and implementation based on its research by establishing a “Public Relations” office, offering short training courses for a variety of professionals including journalists, bankers, construction company executives, collaborating with Hyogo Prefecture officials in establishing a new Earth Science Museum. The challenge of implementation in disaster research is very well put in a short essay by Professor Haresh Shah, Obayashi Emeritus Professor of Engineering, Stanford University, and founding president of the World Seismic Safety Initiative. I have provided this essay as an annex to his evaluation report.

DPRI also faces some strategic decisions concerning its role in Japan and the world. In order to consolidate its position as a world leader in disaster research it needs to expand the number of its foreign student and researchers, use English more as a working language, and publish more in English. DPRI's position of world leadership could also be strengthened by widening the scope of its involvement in research capacity building in the least developed countries of the world (in collaboration with JICA and international agencies).

A significant window of opportunity for consolidation of DPRI's world leadership is opening up with the planning of the World Conference on Disaster Reduction, to be held in Kobe in January 2005. DPRI should seek to have a role in this meeting and in the implementation of the Program of Action (2005-2015) that will result.

In order to ensure the sustainability of DPRI's quality research, beyond financial stability, there need to be additional efforts in open recruitment, mentoring and encouragement of young researchers, and aggressive recruitment of women researchers.

### **DPRI's Expected Roles and Functions**

My own view is that DPRI's central mission should be as core world center of research excellence as well as All Japan Collaborative Center. While not completely free of possible conflicting priorities, I believe on past performance, DPRI can function well in balancing these two roles. It's secondary, but nevertheless important, function should be graduate education. It might be that the amount of undergraduate teaching that DPRI faculty do should be cut back in

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<sup>4</sup> I am aware of one DPRI project that is investigating arsenic contaminated drinking water in Bangladesh and West Bengal.



order to expand graduate teaching. However, I have also heard the argument expressed by DPRI faculty that the undergraduate classroom on Kyoto University's main campus is a good place to recruit graduate students. There is some merit, as well, in this point of view.

The financial base for DPRI's work, given its change to an independent research institute, could be strengthened in a number of ways including offering a fee-based international Masters course in integrated disaster risk management, providing fee-based short courses for professionals, providing fee-based *deluxe* executive briefings in the elegant surroundings provided by Kyoto for top corporate executives. While these suggestions may sound rather exotic and non-Japanese, they have proven their worth in Europe and North America. If DPRI is seen as providing top class value for money, it will be able to attract students and trainees able and willing to pay (or sponsorship by their corporations, etc.).

### **Additional Comments**

As an interdisciplinary institute dealing with very complex earth and techno-social systems (e.g. urban hazards), one challenge is to develop a common philosophical understanding of this kind of research that transcends the particular focus and method of any of DPRI's divisions, centers, and sections. I would recommend expanding the DPRI library with selected works that explore complex systems, philosophy of science, history of science, and methodology. I would also recommend a discussion series internal to DPRI that takes up fundamental terms and assumptions that may be interpreted differently across the disciplines represented at DPRI. Common discussion of such terms as "disaster", "risk", "complexity", and "causality" would begin to illuminate the common denominator shared by all DPRI researchers.

### **Annex: Professor Haresh Shah's Essay, "The Last Mile"**

## The Last Mile

### *Earthquake Risk Mitigation Assistance in Developing Countries*

By

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July 15, 2003  
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### **Preface**

Over the past three to four decades, we have seen many joint programs between developed countries and developing countries to help the later in managing their earthquake risks.

These programs span the whole spectrum of disciplines from seismology and geology to engineering, social science and economy. Many of these programs have been effective in raising awareness, in urging governments to work towards risk reduction, and in spawning an “industry” of disaster management in many of the developing countries. These industries include non-profit organizations, NGOs, for profit organizations, and in general a variety of opportunities for entrepreneurial individuals from urban regions of developing countries.

As these evolving opportunities unfold, we have seen death and destruction due to earthquake after earthquake in developing countries, strongly suggesting that the problems for which those assistance programs were developed are not very effective, at least in the short run. We have seen deaths, injuries, social trauma, economic disruptions, and general interruption of life continue unabated. So it is natural to ask why is this happening. Are the assistance programs reaching the right people? May be we are reaching the right people and doing the right type of things in these countries but we have not allowed enough time for our good actions to take effect. May be we are reaching the right people and doing the right actions for all the miles we need to cover in helping communities mitigate their earthquake risks. The question may be whether we are reaching people who represent the last mile. So in this brief paper, I am not saying that the work many organizations have done over the past few decades in mitigating earthquake risk in developing countries is not appropriate. What I am questioning is whether we have covered that last mile, whether we have reached all the right people, whether we have used the available resources in doing all that we can and should do.

In telecommunication industry, they define the most crucial link between available technology of narrow and broadband communication and the use of that technology by a typical homeowner as the problem of “**Last Mile**”. The reasoning being that unless the last connection between the homeowner and the most sophisticated available technology is not there, all the available technology cannot be effective for the vast market of consumers. The problem of last mile has been a challenge in that industry for many years and still continues to be the crucial link. Giants of telecommunication industries are still battling for the control of the last mile.

Coming back to our focus of risk mitigation in developing countries, it seems to me that we have not done all that we could do in making the connection between those who are trying to help and those who need help, the problem of Last Mile. In this short paper, I will try to articulate what I think is a problem at hand. Why do we keep seeing the catastrophes of Chi Chi, Bhuj, Turkey, Algeria, and on and on. This paper is written to generate discussions, self analysis of our approaches, what we are doing right and what we are not doing right, and hopefully, try to make a proper connection between the last mile and all the programs we (community of organizations around the world working towards earthquake risk mitigation) have been working on so diligently and hopefully for the past few decades. Initially, I will send this brief paper to those who are on my mailing list. However, my plan is to send it for publication in an appropriate journal after I hear about your views from many of you. I will certainly include your ideas in my future versions.

### **Some Observations**

In the context of earthquake risk mitigation in a developing country and the “Last Mile”, I would say that the following actions affect and impact the citizens who will experience the next catastrophic earthquake.

1. Earthquake codes and **their strict implementation** in urban and rural communities for engineered structures.
2. “How to” type of instructions to build non-engineered and rural structures.
3. Helping the village or community build safer homes, safer schools, safer hospitals, and safer community infrastructures.
4. Awareness at the individual, family, and community level of earthquakes and what to do before, during, and immediately after an earthquake.
5. Social and political preparedness for the next catastrophic event at all levels of private and public enterprises.

I am sure there are many such actions that could impact a community or region due to future events that I have not included. That could be a difficult task and for the purpose of this paper, it is not crucial to be all-inclusive. **The point at this time is to understand the context of the Last Mile. In that context, it is that action or actions, which will actually help a community, reduce (or mitigate) its earthquake risk.**

Now, let us look at our own personal experiences over the past few decades. Personally, I have been involved in many professional, non- governmental, philanthropic, academic and similar organizations. Many of these organizations have worked internationally with great passion and dedication to help reduce the problem of earthquake risk in many developing countries around the globe. Many of these efforts have resulted in visible improvements in earthquake risk profiles of communities in developing nations. These efforts have involved meetings, conferences, workshops, seminars, courses, public lectures, and just networking. All these efforts and means to our end are fine and laudable. However, how many of these efforts pass the test of linking with the last mile. Many of these efforts are between people like us the academics, senior governmental officials, and usually the most educated and “aware” people. How many times have we seen that the connection between “us” and the last mile is not complete? It often discontinues after a meeting or a workshop or a conference is conducted. How often a \$100,000 (as an example) grant to help reduce earthquake risk in a specific developing region of the world ends up in spending 90% of that in conducting a workshop or a conference and hardly anything remaining for the last mile? In many developed countries, I have often seen hundreds of thousands of dollars are spent in developing a program, in travel, in discussion meetings, in workshops, etc. and very little left for the final beneficiary who is supposed to be helped by us. How will the risk profile and the risk culture ever change in developing countries unless we are connected all the way up to and including the last mile?

As Kofi Annan, Secretary General of United Nations said in 1999,  
***“Building a culture of prevention is not easy. While the costs of prevention have to be paid in the present, its benefits lie in a distant future. Moreover, the benefits are not tangible; they are the disasters that did not happen”.***

With the current mode of operation of many organizations around the world who are “assisting” developing nations deal with their earthquake risk mitigation efforts, the score card of

how well they are doing will not come until a future date (could be decades). It is quite possible that this future score card will look good. In the interim, individuals and organizations will feel (or will claim) a sense of success at their programs and ways of spending resources. As they say, only time will tell. Unfortunately, this delay in getting their score card will result in time and resources spent, may be making the right connections for the first hundreds of miles and not reaching the last mile, and most important, in lost opportunities.

### **Issues Related to The Last Mile**

It is generally accepted by many who have worked towards earthquake risk reduction in developing countries that non-scientific and non-technical issues play a major role in implementing known risk reduction strategies. Let us look at some of these issues.

- ❖ Perception of risk is an important part. Without the society's understanding of the type and level of risk, it is very difficult if not impossible to develop and implement strategies for earthquake risk reduction. Many developing societies live their daily lives under varieties of risk. Unless it is clear to them as to how earthquake risk fits into their hierarchy of risk, it is very hard for them to either "get excited" or do something about that risk. So the first and foremost requirement for a developing society to implement needed risk reduction strategies is to understand the earthquake risk and how it relates to other man made or natural risks. In my experience, many developing societies have not properly understood earthquake risk. The experts in these countries have done relatively poor job in raising the awareness of the citizenry about the problem and possible solutions. Most experts in those countries have not taken special care in traveling the last mile.
- ❖ In a society with many competing demands on available resources, it is not clear to many as to how one can balance the risk/reward equation. What level of resources need to be spent to achieve an acceptable level of safety is a complex problem. Even in industrialized countries, the answer to such a complex question is not obvious. So in an economically developing country, it is even more difficult to justify the time and resources needed for earthquake risk reduction.
- ❖ There is a wide spread perception that to do anything about mitigating earthquake risk, the immediate or short-term cost is enormous. The technical community has mainly propagated this perception. The message has been that earthquake resistant structures require specialized knowledge and that to build earthquake resistant structures or to upgrade existing structures to some acceptable level of performance, the cost is not trivial. This may be true but such scaler messages impact on the ability of a community to do non-capital intensive actions such as awareness drive, self-help solutions, community based retrofitting, financial risk management options, disaster management plans, non-structural mitigation, etc.
- ❖ There is relatively little communication between researchers, academics, and few well-known professionals and the rest of the country, which is at risk. The few "world class" individuals in the country have not been able to make the citizens,

the engineering community, the governmental organizations, and the regulators aware about the type and level of risk and what measures would buy maximum benefit at minimum cost. This has created an awareness vacuum. Without “bottoms up” interest in implementing risk management strategies, it is very difficult to make any headway towards earthquake risk reduction.

- ❖ The group of professionals such as architects, structural engineers, contractors, government inspectors, etc. have very little professional accountability for poor performance of structures. Even in countries where good building codes exist, there is very little effort to implement and enforce those codes. As a result, we have seen great death and destruction in many recent earthquakes. Ability to practice these professions is not based on licensing or accountability checks.
- ❖ In developing countries, usually an organizational infrastructure that allows a good working partnership between academics, engineering practitioners, government regulators, financial institutions, and social activists does not exist. Thus, the time between the generation of knowledge and its implementation on the ground is excruciatingly long.

These and many such reasons can be cited for a lack of progress in many countries. One of the most frustrating observations that I have made is that there are groups of countries where there is knowledge, there are resources, and there is awareness. Still, there is very little hope in terms of how a major urban center in India or China or Turkey will perform in a future earthquake. What can we do in those countries to make a difference? Is the problem of connecting the last mile making it difficult to achieve desired outcomes? For too long, individuals in some of those countries have been “preaching” to their own kind. And, perhaps, it could be said that foreign “experts” have been preaching to local experts and the resulting information exchange terminates at that level. It is time to change the way risk mitigation and risk management has been approached in these countries. It is important to understand the last mile that will make all the worthwhile efforts connect all the way from articulation of problems to possible solutions and actions.

## **Concluding Remarks**

The main theme of this paper is whether we are reaching **all** the right people and are developing **all** the right strategies for reducing earthquake risk in developing societies. This simple question is put in the context of the “**Last Mile**”. The general concern that is expressed is in terms of the relative expenditure of resources between the last mile and all the previous miles. By their very nature, it seems that considerable resources are spent in articulating the problems, in studying the nature of the problems, and in communicating between the like-minded solution providers. As a result relatively very little is left over or available to connect between all the miles that are traveled and the last mile. If in fact there is some merit in the central theme of this paper, it may be time for all of us to question our assumptions and our actions and make needed modifications so that there is a robust connection to the last mile.