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TOWARDS THE "BAM INTERNATIONAL CONVENTION ON EARTHQUAKE RISK REDUCTION IN DEVELOPING COUNTRIES (BICERDC)"

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ABSTRACT

The earthquake risk in the developing countries is still a major source of life and property losses. This risk is a major challenge as for life safety of the citizens of these countries. Based on this convention a ten year program will be followed in the developing countries in order to reduce the earthquake risk in these hazardous parts of the world. In this article it is suggested that an international campaign (based on a ten years agenda) will be organized having a special focus on diminishing the earthquake risk in the developing countries. This plan is proposed to the materialized in the form of an international convention to be started in the December 2014 in the 11th anniversary of the Bam, Iran earthquake of 26 December 2003 in an international conference.

INTRODUCTION

Most of the earthquake fatalities are reported from the developing countries in the last 70 years (Table-1). This creates progressively the obstacle in such countries in their way towards development and in the ordinary life of their citizens. Kofi Annan, former Secretary General of the United Nations, defined a developed country as; a developed country is one that allows all its citizens to enjoy a free and healthy life in a "safe environment". Therefore a developing country might be categorized as a country that not yet achieved such standards (specially the "safe environment"), but are in the way to achieve them.

Even in a developed country like Japan, there has been a great catastrophe in 2011, caused by an unexpected earthquake and tsunami. The huge earthquake in 11 March 2011 which followed by a destructive tsunami in Japan was largest recorded earthquake in the history. Japan is pioneer in disaster management, especially earthquakes. How this developed country faced this disaster, which had significant worldwide effects? The humanitarian behavior of the Japanese people amazingly wondered the word's media, meanwhile the management of government and authorities showed some deficiencies. The impact of the disaster is followed up after the event and the different impacts are tried to be analyzed in different sectors. The reason of Japanese plans failure was the scale of tsunami, having higher waves than what was assumed, especially in the design of the Nuclear Power Plant. Japanese authorities considered economic benefits more than safety and moral factors exacerbate the situation.

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Table-1: The fatalities of the strong disastrous earthquake in the developing countries in the last 70 years.

Location	Country	Date	Magnitude	fatalities
Ashgabat,	Turkmenistan (then in the Soviet Union)	6 October 1948	Ms7.3	~110,000
Guatemala city	Guatemala	7 February 1976	Mw7.5	~23,000
Tangshan	China	27 July 1976	Ms7.5	~242,000
Tabas	Iran	16 September 1978	Mw7.4	~16,000
Michoacan	Mexico	19 September 1985	Mw8.3	~50,000
Spitak	Armenia (then in the Soviet Union)	7 December 1988	Mw6.8	~50,000
Manjil	Iran	20 June 1990	Mw7.3	~16,000
Izmit	Turkey	17 August 1999	Mw7.4	~16,000
Bhuj	India	26 January 2001	Mw7.7	~20,000
Bam	Iran	26 December 2003	Mw6.5	~33,000
Sumatra	Indonesia (Indian Ocean)	26 December 2004	Mw9.0	>230,000 (Earthquake and Tsunami)
Balakot	Pakistan	8 October 2005	Mw7.8	~85,000
Wenchuan	China	12 May 2008	Mw7.8	~87,000
Port-au-Prince	Haiti	12 January 2010	Mw7.2	~316,000

Most of the countries located in the Alpian-Himalaya Orogenic belt- a highly active seismice zone, are under developping countries. These countries are greatly exposed to earthquakes. They have faced a number of devastating earthquakes such as two earthquakes in 1998 in Afghanistan which caused over 7,000 casualties, the 1948 earthquake in Ashgabat, Turkmenistan, with a death toll of 110,000, the Bam earthquake in Iran in 2003 with over 40,000 casualties, and the 2005 earthquake in Pakistan with a death toll of 80,000 and over 3 million homeless.

Different national as well as internatinal institutions/research bodies have worked to compile data on the location, size and frequency of past earthquakes with their tectonic features that have resulted in creation of earthquake hazard maps for these countries. However little or sometimes non has been done for assessing the "*earthquake risk*". The plans to reduce the earthquake risk in such countries are missing in the most of the under developping countries. Seismic risk is the social and environmental consequences of hazardous events that may occur in a specified period of time.

BACKGROUND KNOWLEDGE

There is direct link between sustainable development and resilience for natural disasters. Natural Disasters cut across many disciplines, including organizational, political, geographic, professional, topical, and sociological. Disaster information needs to be disseminated to all stakeholders at local, provincial, national and regional levels, both public and private.

Seismic risk has been defined, for most management purposes, as the potential economic, social and environmental consequences of hazardous events that may occur in a specified period of time. A building located in a region of high seismic hazard is at lower risk if it is built to sound seismic engineering principles. On the other hand, a building located in a region with a history of minor seismicity, in a brick building located on fill subject to liquifaction can be as high or higher risk.

In reality in our today world and even in developed countries, cities are a mixture of old and new construction. Most new construction complies with strict building codes, and are not expected to have any problems structurally during an earthquake, although they may sway noticeably. But usually the risk of seismic damage to older buildings is quite high. One of the disaster risk reduction themes is determination of seismic risk as the foundation for risk mitigation decision-making, a key step in risk management.

SOCIETAL FRAMEWORK FOR RISK REDUCTION

How people respond to a natural disaster occurring in the under developing countries is often a function of their culturally derived perception from previous training, education, and experiences. The concept of perception as the process of organizing and using information received through sensory observation has been discussed in works as early as The Republic (Plato 511 BCE). A case of perceived tremor origins followed the two great Kocaeli, Turkey Earthquake in August 1999 and Duzce Earthquake in November 1999, where the large Golcuk Mosque was left unscathed by the tremor amidst extensive damage and rubble. Such conditions was also experiences in the Zimmuri, earthquake of May 2003 in Algeria, as well as in the Tsnuami affected Java Island of Indonesia in the great 2004 earthquake in southeast Asia. The appearance of the relatively unaffected mosques supported the notion that the site was indeed 'sacred' and the congregation 'devout'; the quake was caused by Allah to injure or kill those who were unfaithful. However, because the actual damage was so widespread, Muslims are filled with accusations of the liberal variety of Islam and the alignment with the 'liberal' European Union as the cause of the earthquake and its extensive damage. The damages to some of the great mosques in Duzce (in November 1999 Mw7.1 earthquake) and in the Algerian earthquake of May 2003 (Mw6.8) as well as in the Banda Ache earthquake of December 2004 in Indonesia caused that the realistic Muslim scientists think about the real causes of possible damages in the world.

BAM, IRAN 2003 EARTHQUAKE

On December 26, 2003 at 5:26 AM local time(1:56 AM UTC) the city of Bam (Figure-1) and its historical Citadel of Arg-e Bam — "the biggest adobe structure of the world" — were devastated by an earthquake of magnitude Mw6.5. Death toll numbers officially as high as 33,000. An additional 30,000 were reported injured. The most parts of the old Bam Citadel was "leveled to the ground". The high death toll occurred because very few people who were trapped when their mud-brick homes collapsed managed to survive. Since the quake was a huge shock to the society, the recovery actions was very slow and its psychological impact was great. A survey by the author in early 2014 showed that the psychological effects of the Bam earthquake still remain a major problem for about 60% of the inhabitants on the city of Bam (in the tenth anniversary of the Bam 2003 earthquake). The city's two hospitals were completely destroyed by the quake.

Figure-1: Bam after the disaster of Bam earthquake of 26/12/2003, Mw6.5 (photo by M. Zare, 27 Dec 2003).

BALAKOT, PAKISTAN 2005 EARTHQUAKE

The 8 October 2005 Balakot, Muzaffarabad Earthquake (Great Azad Jamu and Kashmir independent state and Sarhad province of Pakistan), with a magnitude of Mw7.7 was a major

earthquake, of which the epicentre was the Pakistan-administered Kashmir. The earthquake occurred at 08:50:38 Pakistan Standard Time (03:50:37 UTC). It is registered as a major earthquake similar in intensity to the 1935 Quetta, Pakistan earthquake, and the 2001 Gujarat, India earthquake. As of 8 November, the Pakistani government's official death toll was 73,276, while officials say nearly 1,400 people died in the Indian administered state of Jammu and Kashmir and fourteen people in Afghanistan. The relief camps in the epicentral region organised after the mainshock. However the government of Pakistan declared that during the relief efforts if a political activity be reported, the correspondent party will be penalized (to be shut down). Even the Christian minority of Pakistan has participated in relief efforts. This major earthquake rocked Kashmir like a natural disaster more than the Pakistani government could handle. So with a toll of more than 73,000 dead, 128,000 injured, and three million homeless, the first question was: Would the relief effort be up to the task?

VAN 2011 TURKEY EARTHUAKE

In Van earthquake of 23 October 2011, Mw7.2 in eastern Turkey, by 644 deaths (of which 470 in Erciş) and the place of epicenter out of Van - about 30 km – and the time of the earthquake occurrence at 13:42 of weekend holiday (Sunday), it seems that the extent of damages and casualties was limited for a country such as Turkey and an earthquake with such a magnitude (Mw7.2). According to the vulnerability of infrastructures in this country, the existence of ethnic tensions in Van province, and the location of the prone area in the most undeveloped eastern part of Turkey, and being away from the country's developed section, the crisis was relatively well managed during and after the quake. After the event temporary shelters installed during a week and distribution of hygienic and alimentary requirements was made possible in 48 hours (People retrieving warm food were 120,000 in Van). These may relate to existence of Van airport and well equipped new hospital of Van, which have been inaugurated in September 2011, a month before the Van earthquake. Other positive point in disaster management in Van earthquake was the Turkish experiences in confrontation the natural disasters. The review of these achievements in the crisis management for our country, Iran, could be very important because of enormous similarity in cultural and economic issues, as well as the proximity of the two countries geographically and analogy in seismicity and vulnerability status particularly in North West of Iran and East of Turkey.

LESSONS LEARNED FROM 2011 TOHOKU JAPAN EARTHQUAKE AND TSUNAMI

In Tohoku earthquake and tsunami of 11 March 2011 despite the unprecedented scale of the quake itself, infrastructures and buildings mostly remained standing and proved the resilience of Japan is planning laws especially in constructions and earthquake technology. Hence, if the earthquake had been the sole problem, then Japan could have claimed for itself a momentous prosperous in planning for the impact of a major earthquake. The reason of Japanese plans failure was the large-scale tsunami, which had higher waves than what was assumed in designing. In addition, the fact that Japanese authorities considered economic benefits more than safety and moral factors exacerbate the situation. Even after the disaster, this country just cared about economic benefits and sought to export its technology to other countries.

However, this disaster was a motivation for people and governments worldwide to replace clean energy with the hazardous one and it was a reminder to decommissioning the old and unsafe operating power plants. Thus, the Metsamor nuclear power plant in Armenia, Iran’s neighboring country, is a critical threat in the region with high seismic risk. Governments had to plan long-term and costly solutions to replace the nuclear energy with clean and renewable forms of it with respect to criteria and moral values, not only the benefits.

Although energy issues and management of power plant’s crisis was a blind spot in Tohoku disaster management, Japanese social ethics and their manner in dealing with the problem were the most advantageous points. Discipline, maintaining calm, public confidence in managers and scientific

management based on the plans helped to improve the situation more quickly. Long queues of Japanese People for food and facilities instead of chaos, which we mainly consider in developing countries, could be a good proof for other countries that enterprising on educating people about how to act in crisis is very operative and effective in enhancement of disaster management.

The 11 march 2011 earthquake was an alarm for seismologist all over the world, particularly in the capital and mega-cities in the developing countries, to revise their methods and evaluation of estimating the plausible time and magnitude of earthquake. It could be an alarm for us to be more meticulous and cautious about the earthquake hazard as prepared and industrialized Japan with the most modernized technology confronted many extensive troubles, which were out of their predictions. Now we should ask this question "how much we are prepared in an earthquake prone country with the most populated and vulnerable cities located exactly on active faults?"

OBJECTIVES

The overall aim of this convention is to enable earthquake risk reduction as a long term agenda in the developping countries; leading to reduced life and monetary losses and casualties. The specific objectives of the Project include:

- Dialogue with decision-makers and sensitization among them about importance of seismic risk vs seismic hazard;
- Capacity building among experts and decion-makers of developping countries;
- Integrating local expertise in a sub-regional context;
- Communicating earthquake risk clearly, accurately and transparently to all users;
- Calculating and updating earthquake hazard using high standards;
- Validating earthquake and shaking probabilities using regional and global data;
- Monitoring and updating changing infrastructure and vulnerability

PRELIMINARY ACTIONS

The seismic hazard zoning map should be prepared (compiled) for the developing countries based on an accepted scale. There are the counties for which the input data are not yet developed (i.e. Afghanistan) and should not be neglected in these efforts. The next step might be the gathering the data on active and fundamental fault from the developing countries and then try to clarify a database.

The ISC-GEM seismicity catalog can be used as a landmark. Developing the integrated seismic hazard zoning map for the developing countries is a priority. The Bam earthquake of 26 December 2003, Mw6.5, (more than 33000 fatalities) occurred in a zone having no evident seismic activity in the last 2000 years. One year later, the Banda Ache earthquake of 26 December 2004, Mw9.0, and the Tsunami that followed the event caused a major earthquake induced fatality (more than 230,000 persons) even in the countries that are not known to be in a major seismic risk (Sri Lanka is an evident example). The earthquake of Balakot, Pakistan (Mw7.6) caused a life loss of more than 85000 in an area that is known, according to the seismic hazard zoning map of Pakistan, to be a *"moderate"* seismic zone. Therefore the preliminary action should be a re-assessment of seismic hazard zoning maps in the developing countries.

ACTION PLAN

Since the most populated/great cities of the worlds are located in the earthquake hazardous area and belong to the developing countries; (Beijing, Karachi, Tehran, Istanbul, Mexico City, Bangkok, Jakarta, Kabol, Xi'an, Mashhad, Santiago, Managoa, Manila). These steps are expected to be followed in the BICERDC;

- Risk Analysis for the Great cities will be evaluated and reported in a 5-year time period.
- The Seismic Risk assessment will be performed in these countries (a country coverage including all inhabitant areas) (a 3 year program, to be started in the 2nd years of the program).
- The reinforcement of the fundamental building and vital facilities and lifelines will be followed up by all these countries (a 5 year program to be started in the 3 year of the program).
- Earthquake Risk Management program will be coordinated in all of these countries as a national agenda based on the details to be provided by BICERDC (a 5 year program to be started in the 4th year of the program). The program will be coordinated by the Hyogo-framework in the time period of 2015-2025.
- The evaluation and synchronization of the activities will be for the cities might be started from the beginning, and the compilation of the obtained results will be presented in the last year of program.

CONCLUSIONS

The major (disastrous) earthquakes listed in Table-1 are all occurred in the developing countries in the last 70 years. The statistics of earthquake fatalities shows that more than 90% of the peoples killed in the earthquakes of the world lost their lives in the developing countries. This article is to summarize the importance of an International convention to be adopted as an international convention by UN in order to provide a road map for reducing earthquake risk in such countries.

Major headlines to be planned in road map are suggested to be 1) the effectiveness of disaster management should be restudied in all hazardous under developing countries; 2) the importance of the high-Tech early-warning systems in reducing risk should be taken into account in all national programs; 3) Reconsidering of extreme values expected/possible hazard and risk levels is necessary; 4) Morality and life safety might be taken as the most important factor in disaster management in developing countries; 5) Sustainable development should be taken as the basis for reconstruction after disaster in all developing countries.

The program is planned to be performed in a 10 year plan between 2015 and 2025. All of the activities will be coordinated by the United Nation and UNESCO and the progress reports will be studied in the annual general assemblies in one of the candidate cities of the developing countries.

REFERENCES

Hyogo Framework for Action (HFA), 2012, http://www.unisdr.org/we/coordinate/hfa.

Dake, K. (1991). Orienting dispositions in the perception of risk: An analysis of contemporary worldviews and cultural biases. Journal of Cross-Cultural Psychology, 22, 1: 61-82.

Havelick, S. W. (1986). "Third World Cities at Risk: Building for Calamity." Environment 28: 6-11, 41-5.

Mills, B., Andrey, J., Yessis, J. and Boyd, D. (2001). "Urban Environment as Hazard Source and Sink." Environment 29(1): 17-38.

Moss, J. and Wilson, G. (1992). People of the World, The Middle East and North Africa. Detroit: Gale Research.

Opricovic, S. and Tzeng, Gwo-Hshiung (2002). "Multi-criteria Planning of Post-Earthquake Sustainable Reconstruction." Computer-Aided Civil and Infrastructure Engineering 17(3): 211-220.

Petak, W. J. and Atkisson, A.A. (1982). Natural Hazards Risk Assessment and Public Policy: Anticipating the Unexpected. New York: Springer-Verlag.

Plato (511 BCE). Republic Dover Publications, Mineola (reprinted in 2004)

Qur'an-e Majid, Rashad Sharif translation 2001 (3rd edition).Universal Unity;

Rosa, E. A. (2003) "Logical Structure of the Social Amplification of Risk Framework (SARF): Meta-theoretical Foundations and Policy Implications." in Risk Communication and Social Amplification of Risk (editors N. Pidgeon, R. Kasperson, and P. Slovic). Cambridge: Cambridge University Press: 47-79pp.

Slovic, P., Fischoff, B., Lichtenstein, S., Corrigan, B. and Combs, B. (000). " Preferences for Insuring Against Probable Small Losses: Insurance Implications" in The Perception of Risk (editor Paul Slovic). London: Earthscan Publications.

Smith, K. (1992). Environmental Hazards: Assessing Risk and Reducing Disaster. London: Routledge.

Taylor, J. L. and Williams, D.G. (1982). Urban Planning Practices in Developing Countries. Oxford: Pergamon Press.

Tobin, G. and Montz, B. (1997). "Natural Hazards and Disasters: When Potential Becomes Reality" in Natural Hazards: Explanation and Integration. New York: Guilford Publication

OCHA , "Japan earthquake report," 19 march 2011. (Online). Available: http://ochaonline.un.org.

Shaw R., S. Parashar, U. Noralene, H. Nguyen, G. Fernandez, F. Mulyasari and J. Joerin, "MEGA DISASTER IN A RESILIENT SOCIETY, The Great East Japan (Tohoku Kanto) Earthquake and Tsunami of 11th March 2011," KYOTO UNIVERSITY, Japan, 25 march 2011.

Vitalis, R. (1995). "The Middle East on the Edge of the Pleasure Periphery" Middle East Report (196): 2-7.