PROPOSED STRATEGIES FOR DISASTER PREPAREDNESS: DARB-E-ASTANEH SILAKHOR EARTHQUAKE, IRAN

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ABSTRACT

Iran is located in one of the most active tectonic regions of the world and has suffered large and destructive earthquakes in the past few decades. Therefore, earthquake preparedness can be regarded as one of the factors which can contribute to the safety of citizens during natural disasters such as earthquakes in this country. In this regard, several measures have been undertaken in Iran to improve the public knowledge on risk and disaster mitigation and management since the last two decades. The aim of this paper is to review disaster preparedness in one of Iran's earthquakes, Silakhor, occurred in March 2006. The earthquake followed the occurrence of a pre-shock which resulted in 63 fatalities and 1418 injuries. Moreover, 330 villages were damaged in Silakhor plain. Challenges and lessons learned are addressed in this paper briefly. At the end, few recommended strategies towards promoting public awareness and education as well as earthquake training are presented for the next probable earthquakes in the region.

It was concluded that a comprehensive plan needs to be prepared in order to address the necessary activities for promoting public awareness among different groups of people from ordinary residents to all related stakeholders. In addition, proper methods as well as means of specific training for providing different types of education and promoting culture of safety against earthquakes should be adopted based on the socio-economic and cultural situations of the local communities. Also, necessary educational initiatives for local residents and professionals as well as regular drills should cover the subjects related to risk mitigation, with the hope that it results in disaster reduction in the country as well as other similar developing countries in the world.

INTRODUCTION

Lack of preparedness usually results in significant material and other losses, both on the onset of the disaster and subsequently. In this respect, education and training are addressed as being among the most practical means of enhancing community preparedness and disaster mitigation.

Disaster education has been effectively implemented in parts of the world for many years. In Japan, experience of devastating earthquakes such as Kanto 1923 Tokyo earthquake, have led the Japanese government to allocate budget on earthquake risk reduction. Many national and international organizations are active in this regard, such as Disaster Reduction & Human Renovation Institute (DRI), Fire and Disaster Management Agency (FDMA), Japan Meteorological Agency, municipalities and urban centers, etc. In Turkey, part of measures taken by Kandili Research Center, University of Bogazici of Turkey (2001-2003), and Civil Defence organization, etc are also remarkable for disaster risk reduction issues (Amini Hosseini, et al., 2009). In USA, the American Red Cross in USA has a long history of educating the public about natural and technological hazards as well as ways to reduce the effects of these hazards on people and their properties. However, evidence of developed public awareness materials from the 1950s onwards does exist with not many printed documents available. In 1980s, the responsibility for developing and disseminating

disaster safety information was spread. For example, those working in Federal Emergency Management Agency (FEMA) Earthquake Program wrote and disseminated earthquake-related materials for the people (Lopes, 2001). Some other agencies which have publications on disaster preparedness in USA include United States Geological Survey (USGS), Association of Bay Area Governments (ABAG), Semi-private centers, etc.

Disaster preparedness activities for the public should be based on participatory approaches involving local communities as much as possible, considering them as proactive stakeholders and not passive targets for intervention. Therefore, "Community-Based Disaster Preparedness (CBDP)" and training has been declared to be one of the most effective ways for successful disaster awareness-raising in various communities in recent years (UNCRD, 2003).

As noted, experiences exist in many developing as well as developed countries on how to promote earthquake preparedness. Iran can be mentioned as an example which is located in the Alpine-Himalayan seismic belt, known as one of the most active tectonic regions of the world. Throughout history, the country has frequently suffered large and destructive earthquakes with considerable damage and casualties. In Iran, several measures have been undertaken to improve the public knowledge on risk and disaster mitigation and management. In this paper, having a look on the issues observed in recent earthquakes of Iran such as Bam in 2003, some strategies towards the improvement of existing programs in developing countries regarding earthquake public education and awareness as well as disaster professional training is presented.

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After the Bam earthquake, further activities were carried out to improve the public preparedness against earthquakes and mobilization of community residents and officials to face the effects of such events. Moreover, specialized courses for improving risk management in the country have been planned and organized. However, only considerable improvement could be observed in terms of public awareness up to the Darb-e-Astaneh-Silakhor earthquake.

The Silakhor earthquake occurred on 31/3/2006 at 4:47:02 local time (1:17:02 GMT) with magnitude of M_L=6.1 within Southeast of Borujerd in Southwest of Iran, after the occurrence of several relatively strong foreshocks. Depth of the earthquake was about 14 km and the intensity at the epicenter is estimated equivalent to VIII (in Modified Mercalli Intensity Scale) (Mirzaii and Sinaian, 2006). According to the official reports, the earthquake had 63 fatalities and 1418 injuries. Moreover, 330 villages were damaged in Silakhor plain.

The most important reasons of better public awareness and low number of recorded casualties in this event are:

- Most residents have experienced some tremors during their lives and therefore they were mostly sensitive and aware about the seismicity of their living places;

- After the Bam earthquake, actions by various cultural, social and technical institutions were done in order to promote awareness of earthquake risk. These initiatives such as TV programs (national and regional), media and press reports, actions by local NGOs and organizations such as RCS as well as extracurricular programs had considerable effects on promoting public awareness of earthquake risk;

- Holding drills for earthquake preparedness in schools had also considerable effects to promote earthquake public awareness. Table (1) shows earthquake safety drills in schools after Bam earthquake up to year 2007 in Iran.

It seems that due to the above-mentioned reasons, people were more sensitive in Silakhor earthquake and that is why they left their houses and could save their lives after feeling foreshocks just before the main earthquake did occur.

Although it appears that public awareness in this region was desirable in comparison to other parts of the country, but in other aspects of preparation such as precautions for self-relief and fellow-relief, improvement of construction quality, etc., still the situation was not very acceptable. In fact, only small number of people (mostly in Borujerd and Doroud cities) had passed training courses on rescue and relief. Due to the unfamiliarity of people in villages, problems were created for those trapped under debris, especially people suffering fractures or bleeding (Anbari, 2007).

Table 1. List of school drills carried out between 2003 to 2007*

	Year	Number of Schools	Number of Boys	Number of Girls	School Level	Place
Special Drill in commemoration of the 40th Day of Bam Eq.	2004	110,000	8,300,000	7,700,000	All grades	Nationwide
The 6th National Earthquake Drill	2004	120,000	8,100,000	7,600,000	All grades	Nationwide
The 7th National Earthquake Drill	2005	110,000	7,872,610	7,391,739	All grades	Nationwide
The 8th National Earthquake Drill	2006	110,000	7,392,176	6,939,726	All grades	Nationwide
The 9th National Earthquake Drill	2007	146,213	6,364,991	7,443,162	All grades	Nationwide

** For more update on drills, refer to www.iiees.ac.ir website.*

In addition, a majority of people knew little about the importance of earthquake resistant construction. This issue shows that planning for public awareness should not be limited only to promote preparedness and response and can be extended for improving earthquake resistant construction as well. Regarding the professional skills among the relevant bodies, the following items can be mentioned:

- Academic and training courses were developed on topics related to earthquake and other natural hazards as well as risk reduction methods, such as courses in Masters and PhD levels in earthquake engineering, disaster management, reconstruction and many other related fields;
- Training courses for professional engineers and other staff involved in construction or disaster management were developed. Some of these courses included improvement of resistance of building, disaster management, urban planning, etc. which were organized by professional organizations such as IIEES, BHRC, Institute of Applied Science, RCS, and other related centers;
- Training courses for technical people working in the construction industry were developed by various organizations such as technical training and professional organizations, department of labor and other related organizations;
- Several seminars and specialized workshops on various topics related to risks and disaster management were held by private and public sectors;
- Training courses on first aid, rescue and relief, and earthquake drills were organized by RCS in different provinces.

Despite these activities, the professional knowledge of workers and disaster management staff in the region was limited due to some reasons, such as: lack of appropriate use of specialized workers; educational limitations; occupation of workers without checking their licenses and skills; lack of coherent programs to provide training and professional standards; insufficient specialized courses in small cities; lack of proper specialized courses for construction workers in rural areas; limited usage of academic research; and lack of attention to scientific research by executive officials.

Based on these issues, the most important lessons of Darb-e-Astaneh-Silakhor earthquake in preparedness aspects can be listed as follows:

- Although it appears that the public information in this region was more desirable relative to other parts of the country, but the status was not acceptable in issues such as actions or measures for self-relief and fellow-relief as well as improvement of construction. In fact, only few numbers of people, mostly in Borujerd and Doroud cities had passed training in courses for self-relief and rescue (RCS Final Report, 2006).
- Preparation of disaster management institutions and regional authorities for confronting big seismic events was relatively limited. Items and equipment needed in the region for conducting emergency response were not sufficient and there were no command center in the region;

- Regarding technical training, the situation was not acceptable. Most people employed for construction, especially in rural areas or people working in risk management and crisis task forces, suffered from lack of enough information for carrying out specialized tasks properly.

CHALLENGES AND LESSONS LEARNED

Challenges and results of Darb-e-Astaneh-Silakhor earthquake in the field of earthquake preparedness are stated in Table 2 (Izadkhah and Hosseini, 2007; Izadkhah and Amini, 2010):

Table 2. Challenges and effects of Silakhor earthquake in the field of earthquake preparedness

Issues	Challenges	Consequences
Preparedness to confront the effects of disasters	- Lack of existence of Emergency Operations Center (EOC) - Improper coordination between organizations and affiliated institutions - Absence of drilled emergency operation systems - Absence of operation plans specifically prepared for initial hours - Incapability of preparing and dispatching rescue forces to the region - Lack of needed information regarding the regions conditions - Lack of awareness of dispatched forces on region's situation - Lack of sufficient facilities and necessary equipment - Lack of cooperation between people and authorities	- Necessity for implementing the relief and rescue master plan in various dimensions - Necessity for creating emergency operation centers at local and provincial levels - Necessity for improving coordination and drills between relevant systems - Necessity for implementing disaster operation systems - Necessity for creating capacities and improving aid at local level - Importance of using regional aid for guiding operations and planning - Necessity for optimum usage of local residents
Public education and awareness	- Lack of considerable implementation by affiliated organizations in order to improve people's preparedness - Limited activity of media in disaster management - Lack of people's awareness about possibility of earthquake occurrence in the city - Lack of people's awareness of search and rescue and relief	- Necessity for multilateral planning in order to improve awareness - Necessity for presenting self-relief & fellow-relief training to people through media or local centers - Necessity for informing about the importance of living in safe places
Professional training	- Limitation on using skilled labors - Limitations on holding training courses especially in villages and small towns - Problems faced in retraining the employees - Weakness in planning and implementing training courses - University researches disregard to practical usage - Lack of attention of local authorities for human resource development	- Necessity for planning and using technical courses in various levels across the country and motivating participation - Prohibiting the use of unspecialized staff in construction - Necessity for time schedule - Necessity for using all local and provincial facilities to develop trainings

RECOMMENDED STRATEGIES

Considering the existing global experiences and based on lessons learned from the recent events such as Bam earthquake in Iran, the following strategies can be proposed for promoting the present conditions in Iran and most of the similar developing countries in the field of public awareness and professional training in disasters.

PROMOTING PUBLIC AWARENESS AND EDUCATION

Some of the issues that can be considered in promoting public awareness and education are as follows:

- Preparing a comprehensive plan to address the necessary activities for promoting public awareness among different groups of people from ordinary residents to all related stakeholders;
- Highlighting the role of media as well as the local community centers, such as mosques in Moslem countries in the comprehensive plan. Considering the differences between target groups, the materials should match each group and be presented in a way to be understandable to them. Moreover, proper channels for providing these materials should be selected from the existing alternatives, including written materials, photos and files, movies (short and long), animation, teasers, trailers, etc. Also, the media for providing these materials should be chosen from radio and TV, newspapers, posters, brochures, internet, etc.;
- Concentrating on the activities necessary for promoting preparedness in special time frames. However, in most of the developing countries, these activities are planned to be implemented in specific time which have less effectiveness. In fact, the sustainability of training programs is one of the important measures that can assure their effectiveness;
- Harmonizing the activities of different institutions in the field of public education and information dissemination;
- Proper training in order to provide different types of education and promoting the culture of safety against earthquakes. The training should be adopted based on the socio-economic and cultural situations of the local communities in order to cover most of the population at risk;
- Organizing regular drills and practices for different target groups. This will have important impacts on enhancing preparedness to confront potential earthquakes. In addition, earthquake museums and related national parks can play important roles in promoting knowledge and awareness on earthquake and mitigation measures among the residents;
- General training for local residents. This should explain the ways of sheltering or emergency response, as normally can be observed in developing countries covering subjects related to risk mitigation and reduction.

PROMOTING PROFESSIONAL TRAINING

The following issues can be mentioned in regard to promoting the professional training:

- Improving the skills of workers in construction has important impacts on earthquake risk reduction. Thus, necessary training courses should be implemented for local workers in urban and rural areas;
- Controlling the expertise of these workers by municipal governments or local authorities may encourage them to participate in training courses and improve their skills in construction. In addition, by controlling the work license of the workers, it would be possible to reduce the vulnerability of new constructed buildings;
- Training regularly for disaster management staff in order to improve their capacities in using the advanced knowledge and technologies in implementation;
- Controlling the skill and knowledge of those working in related fields of risk reduction and management should be prepared and applied;
- Increasing the culture of safety in construction stage can be also promoted through media;
- Documenting the impacts of previous events can play an important role in risk reduction, if used by relevant authorities.

CONCLUSIONS

The paper addressed the necessity for promoting earthquake preparedness through education and training in developing countries such as Iran with high risk of earthquakes. Silakhor earthquake in Iran is

investigated as a case study. Based on the global experiences and lessons learned from this earthquake, recommended strategies towards promoting public awareness and professional training are addressed in this paper for expansion of disaster education towards sustainable development objectives. Also, a comprehensive plan needs to be prepared in order to address the necessary activities for promoting public awareness among different groups of people from ordinary residents to all related stakeholders. In addition, proper methods as well as means of training for providing different types of education and promoting culture of safety against earthquakes should be adopted based on the socio-economic and cultural situations of the local communities. At the end, necessary training for local residents and professionals as well as regular drills should cover the subjects related to risk mitigation, with the hope to result in disaster reduction in the country as well as other similar developing countries in the world.

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