



Earthquake disaster risk management planning in schools

Earthquake
disaster risk
management

Mahmood Hosseini

*International Institute of Earthquake Engineering and Seismology (IIEES),
Tehran, Iran, and*

Yasamin O. Izadkhah

*Humanitarian Resilience Centre, Defence Academy, Cranfield University,
Swindon, UK*

649

Abstract

Purpose – This paper aims to develop an appropriate earthquake disaster management system for Iranian schools with a main focus on non-structural problems of schools during disasters.

Design/methodology/approach – A framework is proposed for disaster management planning regarding earthquakes in three phases: before, during, and after an earthquake. A detailed description of the proposed management system is also presented with special application to schools, focusing mainly on non-structural problem.

Findings – There is a need to emphasise on a national-level contingency planning that includes developing and designing detailed plans for a proper response and training of relevant personnel. Another important issue, which needs special attention is the material which should be taught to the commanders of emergency activities at various levels in order to help them to control an effective emergency situation.

Practical implications – By using the “emergency management system” proposed in this paper for Iranian schools the authorities can make sure that they have utilized all of their resources for an efficient disaster risk management. It is hoped that other developing countries can also benefit from the proposed programme.

Originality/value – The originality of this paper is in the comprehensiveness of the “emergency management system” proposed for the schools, and the approaches it suggests for constructing the “safety culture” in society.

Keywords Children (age groups), Developing countries, Schools, Disasters, Earthquakes

Paper type Research paper

1. Introduction

Prevention and pre-disaster mitigation are necessary steps for achieving sustainable development. This should be expanded to different levels from school to homes and then to communities. Earthquake preparedness planning should aim at developing a “Safety Culture” in which the general public are aware of the hazards which will confront them and provides the knowledge with which people can protect themselves.

Iran is located in the Alpine-Himalayan seismic belt, as one of the most active tectonic regions of the world. In the last few decades, the country has experienced several major earthquakes which have claimed hundreds of thousands lives and billions of property damage (Izadkhah, 1998; Iran mania, 2005). In addition, around



The authors would like to thank Ian Davis, Visiting Professor in Cranfield University, for his valuable comments on the final version of this paper.

18 million children are studying in various levels in the educational institutes in Iran which is almost one fourth of total population. Therefore, the importance of children as the future assets of the country is very important. It is also evident that preparedness in schools will be increased through education and awareness of children and training the school personnel including administrative staff, teachers, and headmasters. In this regard, proposing a comprehensive disaster management programme for hazard mitigation and public awareness for important critical facilities especially educational institutes such as schools seems crucial. In fact, educational places such as schools are among the most important buildings exposed to serious damage and loss of life from earthquakes.

Additionally, educating the children, as the future of any community at risk, can be considered as an effective strategy to communicate safety messages to the entire community. In other words, educating the children serves to disseminate vital information to most of the population via the knowledge, skills and enthusiastic motivation of children. They convey messages throughout society, starting with their parents. Consequently, schools play a major role in the development of disaster-aware citizens. Furthermore, schools can be regarded as one of the ideal places for conducting earthquake awareness activities and an appropriate atmosphere and environment for the learning and transfer process.

After the International Decade for Natural Disaster Reduction (IDNDR) and with the initiation of International Strategy for Disaster Reduction (ISDR) in 2001, a strong shift has been placed from post-disaster activities to pre-disaster mitigation and preparedness policy especially in countries such as Iran which are in the continuous exposure to risks. Also the level of preparedness activities is more focused in younger groups of the society. According to the most recent data from the Ministry of Education, around 18 million students (6-18 years old) are studying in different elementary, secondary and high schools in Iran in about 45,000 schools. Approximately 19,000 of these schools are in the capital city of Tehran, shown in Figure 1.

The focus in this paper is on protecting children as one of the most vulnerable groups in the society. If the children are at school in the time of a disaster, many questions arise such as:

- Are the children aware of what to do?
- Should they be kept indoors or they should be let out?
- What is the responsibility of the school personnel?
- How should the parents be notified in case of a disaster?
- What are the main things everyone should do in an emergency?

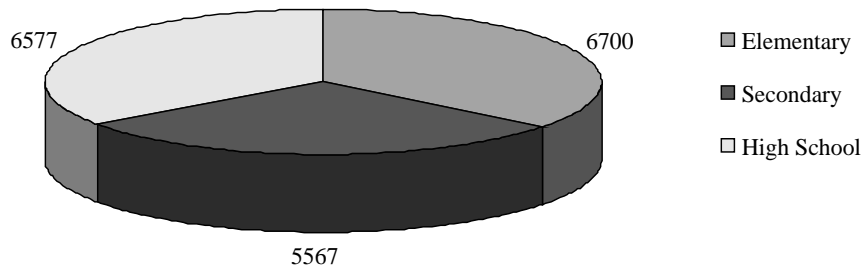


Figure 1.
Number of schools in
capital city of Tehran

- Is there a system that can manage the consequences of the disaster?
- Have the roles and responsibilities of the students, teachers and headmasters been identified and scheduled in advance?

The structural and non-structural damage to educational institutes such as schools in Iran should be considered. In this respect, a research project by experts of the International Institute of Earthquake Engineering and Seismology (IIEES) has investigated the resistance of school buildings in Tehran. Consequently, it has been revealed that most of the school buildings are vulnerable to earthquakes. Lack of safe structures and stability in schools during disasters such as earthquakes result in destruction of school buildings and in turn threaten the lives of students. Similar projects and research are also in the process in other countries. Other projects such as “School Earthquake Safety Initiative” (SESI) by United Nations Centre for Regional Development (UNCRD, 2002) also look at vulnerability evaluation of schools as well as disaster preparedness which is in place in many developing countries.

2. Relevant literature

Several studies have been conducted in recent decades investigating the seismic safety of schools, some of which are reviewed in this paper. Although the development of seismic design provisions for schools goes back to mid 1950s during which some works were done on criteria for structural design in California schools (Ewing and Herd, 1956), it took more than 20 years since the first official regulations was published for design and construction of school buildings for the protection of life and property by California Seismic Safety Commission (CSSC). CSSC (1979) published “The Field Act” which prescribes a system of procedures and reviews to be followed during the design and construction of public school buildings.

Since, late 1970s, many researchers and authorities became concerned about the seismic safety of schools in general, and many reports have been published on the issue. However, those works and researches only provided provisions which apply to reconstruction, alterations, and additions and generally lack any concern for effective “Disaster Management”. Almost ten years after, a conference was held at Buffalo, New York, entitled “Disaster preparedness: the place of earthquake education in our schools” (Ross, 1989). This seems to be the threshold for considering education as a necessity for earthquake preparedness and disaster mitigation.

A year later, Japanese researchers demonstrated their attention to the issue of “Earthquake preparedness of primary and secondary schools” (Ohmachi *et al.*, 1990). In their study, a questionnaire survey on disaster preparedness in Japanese schools was conducted with the main focus on earthquake preparedness. Out of 600 primary and secondary schools in 10 prefectures, 298 schools responded. The questionnaire consisted of 25 questions pertaining to five major categories. These were:

- (1) hazard identification;
- (2) earthquake drills;
- (3) immediate response;
- (4) communication; and
- (5) post-earthquake shelter planning.

In another study by Kuban (1992), the crisis management strategies for school administrators were discussed from various aspects, and information concerning community-wide, system-wide and institutional disasters was provided. Kuban suggested that students and the school staff members can be directly involved in disaster response and providing assistance in necessary situations.

Almost at the same time, the Emergency Management Institute of National Emergency Training Center (NETC, 1992) held a 16-hour course, entitled "Earthquake Safety Program for Schools". The "cascade philosophy" behind the course was that people attending would return and teach others in their school or school districts. The ultimate aim was to give participants the knowledge and motivation to effectively teach others about the need for an earthquake safety programme.

Few years later, Building Safety Division at the Department of Public Works, Municipality of Anchorage in Alaska developed some special packets to help school personnel create, supplement, and revise their earthquake emergency procedures (Municipality of Anchorage, 1995). The packets were assembled with the assumption that each school differs from others in their level of preparedness and commitment and amount of available resources. The document was prepared based on a revision of the book *Earthquake Ready: Preparedness Planning for Schools* developed by the Bay Area Regional Earthquake Preparedness Project for the California Office of Emergency Services.

In a study by Milutinovic and Trendafiloski (1998), the exposure of the Republic of Macedonia to dominant natural and man-made hazards was considered. The study concludes that earthquakes and their adverse effects are the most disastrous to the population and the man-made environment. They claimed:

Particularly vulnerable are the school buildings, since 69.4 percent of them have been built with no regard for any seismic safety conditions, and only 58.7 percent satisfy the standards for the intended use. The conditions are even worse because 17.8 percent of the total population of the Republic of Macedonia is accommodated in such facilities for at least 8 hours daily, and there is a high probability that 100 percent of school buildings might be exposed to intensities 1 greater than or equal to VI MCS, with 98 percent of school buildings and 99 percent of pupils exposed to intensities I greater than or equal to VII MCS.

Presently, Macedonia's economy lacks the capacity and resilience to undertake consistent engineering prevention measures, therefore, the emergency preparedness of schools administered as a technique is proposed in order to substantially reduce the impact of the earthquakes on a cost efficient basis.

Rowling (1999) emphasises on the role of policy in creating a supportive social context for the management of loss experiences and critical incidents in school communities. In this study, he claims that school communities are globally experiencing traumatic events that have the potential to affect the following:

- the mental health of those involved;
- the academic progress of students;
- the work life of teachers; and
- the public perception of schools as safe physical and psycho-social environments.

He believes that this potentially widespread impact necessitates the adoption of a comprehensive management strategy, and tries to describe suggestions for management of these incidents based on the following: a social construction of grief;

an ecological public health perspective on loss and grief; and research on educational change. He uses the elements of a supportive school environment to exemplify the proposed approach through the development of a critical incident management plan. His suggested “working policy” demonstrated a coherence between practices and philosophy which indicates a proactive approach for loss, grief, and critical incident management and a legally accountable organisation.

In another study conducted in the UK, Kibble (1999) examined and discussed the guidance and support offered to schools by 17 local education authorities in respect of crisis management. In that study, after outlining some of the main features of the documents studied, he concludes that there is a considerable variation in the amount of guidance given to schools. The study suggests that every school should have a member of the Senior Management Team who has critical incident management planning as part of their job description. Kibble notifies that the guidance given by all the local education authorities surveyed focuses on accidents on school trips and suggests that more attention needs to be paid to plan for preventive and precautionary measures in dealing with floods, fires, structural damage and incidents.

Pearce (2003) in a paper on “Disaster management and community planning, and public participation” discusses the way for achieving “Sustainable hazard mitigation”. A brief historical overview of disaster management planning is presented in the paper. It also reviews the Australian and American research findings and their emphasis on the shift of focus from response and recovery to sustainable hazard mitigation. For this purpose, it is necessary to integrate disaster management into community planning. Pearce claims that current practice seldom reflects such a synthesis, and this is one of the reasons why hazard awareness is absent from local decision-making processes. It is also included that if mitigative strategies are to be successfully implemented, the disaster management process must incorporate public participation at the local decision-making level. The paper concludes with a case study of California’s Portola Valley, which demonstrates that when public participation is integrated into disaster management planning and at community level, it results in sustainable hazard mitigation.

A two year project on “Reducing Vulnerability of School Children to Earthquakes” has been launched in Republic of Indonesia, India, Republic of the Fiji Islands and Republic of Uzbekistan by UNCRD, Disaster Management Planning Hyogo office (UNCRD, 2004). The project aims at ensuring safety of school children and creation of earthquake-resilient community in seismically vulnerable areas by retrofitting the school buildings, demonstrating retrofitting technology training and disaster education. The activities included in this project seek to:

- assess seismic vulnerability and enhancing seismic safety by retrofitting schools as model cases;
- demonstrate earthquake-safer construction practices;
- enhance the capacity of masons and engineers;
- raise awareness of students and communities through disaster education; and
- disseminate case study experiences widely throughout the target counties and their respective regions.

Throughout the project, it is expected to diffuse earthquake disaster prevention culture and enhance the capacity of seismically vulnerable communities in the Asia-Pacific region.

Considering the existing literature, it is observed that although in conducted studies many aspects of disaster management at schools have been discussed, still few researchers have proposed a detailed description of various phases of disaster management plan and its required provisions, particularly for developing countries. Therefore, in this paper, first a framework is proposed for the “Disaster Management Planning”. The necessary provisions for the three phases, namely before, during, and after earthquake are then explained. A detailed description on the proposed disaster management system is also presented and the expansion of a disaster management system for schools, which is the main aim of the study, will be emphasised thereafter. The paper mainly focuses on non-structural problems of schools in disasters.

3. Disaster management planning

United Nations Development Programme (UNDP) has proposed Table I as preparedness framework for a disaster (*UNDP Manual*, 1990) which emphasises on planning as one of the requirements of the programme.

Disasters do often require a response team which is best planned and prepared before a disaster strikes (Dynes, 1970; Quarantelli, 1985). It is obvious that the necessity of giving services to important places such as schools in the time of disasters requires preparedness. This necessity can be due to factors such as the:

- occupancy of schools by children as one of the most precious resources and the most vulnerable groups of the society; and
- possibility of using schools as temporary shelters after major disasters or before disasters where there is a warning period.

During a disaster, the initial outcome of an earthquake is convergence. The dangerous situation generated by the unorganised and frightened students as they rush out from the exit doors to an open area. They may also create problems for the school personnel including teachers, assistants and the administrators. The students and the school staff can be directly involved in disaster response and providing assistance in necessary situations (Kuban, 1993). Therefore, having a coordinated, comprehensive and appropriate disaster management system is necessary in schools beforehand. This system should consider three phases of before, during, and after an earthquake. In this regard, there are some necessary activities that should be planned such as:

- conducting and implementing public education of “Preparedness against earthquakes in schools”;
- vulnerability identification of schools (structural problems);
- having periodical meetings with the students’ parents, since the parents post-quake responses partially determine the success or failure of the school’s disaster plan;
- having periodical meetings with disaster management experts;

	Vulnerability assessment	Planning	Organisational frame
UNDP proposed preparedness framework	Information system Response organisations	Basic resources Public education	Warning systems Exercises

- allocating necessary commissions for planning and allocating the responsibilities;
- establishment of an executive earthquake management council in schools under the auspices of Ministry of Education; and
- identification of the necessary programmes and allocating the activities and responsibilities.

Preventive measures should be considered before the earthquake. Its planning can be scheduled by the school headmasters, staff and the representative groups of students. Also it can benefit from the consultation of the students' parents. Part of the necessary activities that can be planned as preventive measures before an earthquake are proposed and shown in Table II.

It is also proposed that practicing drills which is believed to be one of the most favourite activities among the students (FEMA, 1990b; Izadkhah, 2004) should be planned and scheduled by the school's headmasters and to be performed in specific

No.	Provisions	Remarks
1	Psychological preparation of the staff and students for a probable earthquake	To think of the fact that there is a probability of the occurrence of an earthquake at anytime
2	Planning for earthquake educational initiatives in schools	To have materials in hand for increasing the student's knowledge on the disaster
3	Asking the structural experts to visit schools for their resistance (FEMA, 1990a)	This helps in assessing the vulnerability of the school building
4	Increasing the safety of school building	This results in less damage produced by earthquakes
5	Selecting a number of students for relief and rescue teams	This involves the students in co-operative work
6	Training selected students for first aid activity and earthquake drills	Those who have got some training in advance or the volunteers are more appropriate for this
7	Allocating and identifying the roles and responsibilities	This results in a very harmonious and coordinated work
8	Preparing guidelines for the time of a disaster for students and school authorities	This adds to the preparedness provisions
9	Preparing a map of the school building	To identify the safe and dangerous places in the school
10	Identifying the physical blockage in the route ways and lack of communication service with the outside world	To cope more effectively with the disaster
11	Ensure the proper performance of the facilities that may cause problems in the time of earthquakes, like electricity, gas piping, under-ground channels and so on	To minimise the risks beforehand
12	Preparing necessary equipment	To have the equipment ready to use in an emergency
13	Having special drills in schools for preparedness on a regular base	This can be scheduled by the school administrators three times a year in the school
14	Allocating the responsibilities to related personnel in schools	This can be scheduled by the school administrators

Table II.
Part of the necessary provisions in schools before an earthquake

times in a year in the schools by trained teachers. The objective of these practical and simulated drills can be summarised as:

- simulating drop, cover, and hold;
- evacuation (Kaji, 1992);
- emergency response activities;
- simulating an unreal earthquake (Izadkhah and Hosseini, 2003);
- exercise coping mechanisms in a variety of situations and conditions;
- familiarising with different preparedness procedures.

Also, few other provisions can be planned in advance to meet the needs of the people and students in the third phase presented in Table III.

4. Disaster management system

Disasters are a reality in the life of people who live in a hazard-prone country. A well-coordinated response can save many lives and reduce the damage in a disaster. Therefore, there is need to expand a system that each group of the society and the organisations can rely on their own sources and ingenuity for a while before a gradual return to normality. This requires an efficient organisation of resources, staff and prioritisations of actions with time and an understanding of the possible consequences of the disaster (Coburn and Spence, 2002).

In this regard, the authors propose a chart for disaster management action planning in schools shown in Figure 2. Various operational teams should be assigned to work in coordination with each other in different phases of before, during and after a disaster with assigned roles and responsibilities. Some teams can be more functional before the earthquake happens, whereas some of them should be coordinating in all three phases.

4.1 Support team

The support team should identify the earthquake hazards in schools and to solve these problems with the help of experts and the students' parents. Part of this teams' responsibility includes:

- preparing the necessary requirements and place them in a safe place to be used for at least 24 hours after the earthquake;
- conducting a map of the whole school location;
- identifying the dangerous and safe places;
- preparing necessary kits after the earthquake including water, food and necessary medicines;
- consideration of the schools water supply, electricity and gas; and
- observation of the emergency exit doors in the school.

Table III.
Part of the necessary provisions in schools after an earthquake

1	Preparing the school area for evacuating students and people
2	Making the area suitable for search and rescue (SAR) activities without any serious disturbance
3	Training school authorities as well as students for first aid assistance
4	Identifying the most safe and dangerous places in schools
5	Making sure that all the involved groups know their responsibilities

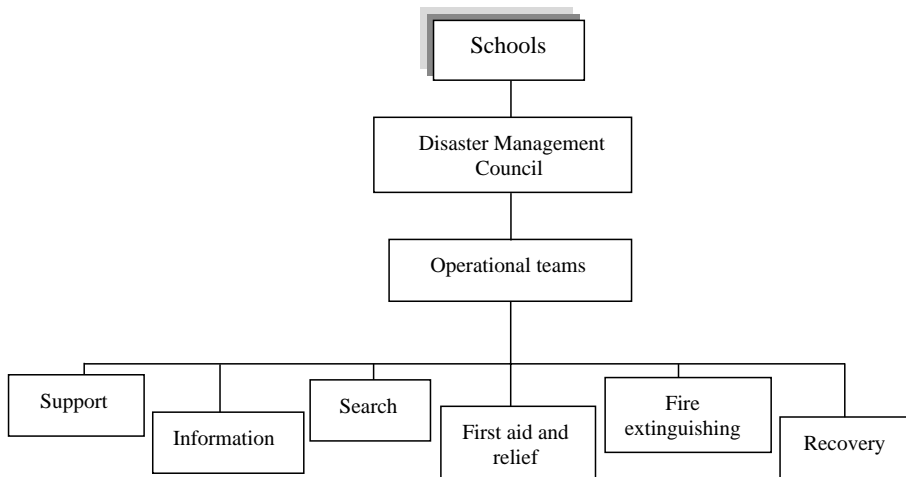


Figure 2.
Proposed chart of different
operational groups in
schools

4.2 Information team

Part of this group's activities relates to post disaster which can be:

- the development of an appropriate earthquake plan;
- awareness of the existing conditions;
- offering information and guidance to students and their parents;
- information control and notifying it to the search, relief, fire extinguishing and support teams;
- awareness of the emergency exit doors and connection ways;
- preparing a list of the emergency telephone numbers of children's relatives; and
- announcing a report of the disaster consequences.

4.3 Search team

This group addresses the search and rescue after disasters, of which the main activities are:

- inspecting the school building;
- observing the damaged area in the school; and
- evacuating and transferring the injured students and school personnel to safe places outside the damaged area.

4.4 First aid team

The first aid team consists part of the relief teams who are trained beforehand. Some of their activities include:

- offering first aid to the injured;
- preparing a list of the physical conditions of students and the school staff;
- assisting the students who need emotional and mental consulting; and
- providing assistance to even less injured, and calming them by giving advice to them.

4.5 Fire extinguishing team

The probability of a fire after an earthquake is very high. The fire group operates in:

- inspecting the school building;
- preparing fire capsules for extinguishing fire after the earthquake;
- inviting students to relax in the time of a fire;
- preparing guidelines for fire safety; and
- evacuating the school area when there is no chance to extinguish fire.

4.6 Recovery team

Part of the team activities includes:

- the long-term recovery and normalising the situation in the school;
- re-offering the emergency services at the school; and
- providing physical and psychological assistance to more sensitive students.

Activities of some school related institutes and organisations in various phases of disaster management planning are proposed in Table IV. As shown, some organisations are involved in all three different phases, whereas few have emerging duties only in one or two of the phases.

In addition to what is proposed, other provisions may also be considered in the emergency planning for the schools such as:

- backing-up the disaster plans;
- having a psychological plan;
- considering security issues after the earthquake;
- updating earthquake educational programmes;
- involving students in activities related to earthquake preparedness;
- involving parents in related disaster activities;
- inserting more updated earthquake materials in the school curriculum;
- conducting regular assessment of the plans and to ensure their compliance with the safety policies;
- regular monitoring of the operational groups activities;
- ensuring greater coordination of school safety plans; and
- increasing awareness among national educational organisations.

Table IV.
Related activities in
disaster management
planning

No.	Organisation	Time of disaster		
		Before	During	After
1	Red Crescent Society of Iran	*	*	*
2	Ministry of Education	*		
3	Disaster Management Council	*	*	*
4	Fire and safety organisation		*	*
5	IIEES	*		*
6	Non-governmental organisations (NGOs), national and international		*	*

5. Conclusion

Natural disasters such as earthquakes often result in extensive casualties and damage. The location of Iran and many other developing countries in active tectonic regions of the world emphasises the necessity to develop a comprehensive disaster management system that considers critical facilities including schools and other educational institutes. The disaster management system proposed in this paper addresses different phases of the disaster by assigning responsibilities to various operational teams in order to mitigate the consequences of the disaster. Also there is a need to emphasise on a national-level contingency planning that includes developing and designing detailed plans for a proper response and training of relevant personnel.

Monitoring, reviewing, and updating the disaster plans and the development of new initiatives should be built on and monitored through key performed indicators. The assessment of the existing disaster management systems in schools can increase their effectiveness. The evaluation should be undertaken on a regular basis toward the improvement of these initiatives. Key indicators should focus on programme implementation, services, and functioning of the system. One of the other important issues which needs special attention is the material which should be taught to the commanders of emergency activities in various levels in order to help them to control an effective emergency situation. They should be aware of the difference between the management of schools in normal situations with controlling them in a major emergency such as earthquake. In the meantime, students, teachers, and parents could be trained effectively to play an important role in reducing the risks by implementing the new system. A motivated, well prepared and an influential community is a key to a "culture of safety". It is hoped that the development of this system can contribute to the reduction of the disastrous consequences of the future earthquakes for Iranian children and their families. In addition, other developing countries can also benefit from a similar disaster management system in their countries based on the proposed model.

References

- Coburn, A. and Spence, R. (2002), *Earthquake Protection*, 2nd ed., Wiley, New York, NY.
- CSSC (1979), *The Field Act and California Schools*, SSC 79-02, California Seismic Safety Commission, Sacramento.
- Dynes, R.R. (1970), *Organised Behaviour in Disaster*, DC Heath, Lexington, MA.
- Ewing, M.A. and Herd, C.M. (1956), "Criteria for structural design in California schools", *Proceedings of the World Conference on Earthquake Engineering: Berkeley, California, Earthquake Engineering Research Institute, San Francisco*, pp. 36-1 to 36-15.
- Federal Emergency Management Agency, FEMA (1990a), "School preparedness", Building Seismic Safety Council. 150, Series 35, Federal Emergency Management Agency, Washington, DC.
- FEMA (1990b), *Guidebook for Developing a School Earthquake Safety Programme*, revised FEMA, Washington, DC, 88.
- Iran mania (2005), available at: www.iranmania.com/News/ArticleView/Default.asp?NewsCode = 32697&NewsKind = Current%20Affairs (accessed June 2005).
- Izadkhah, Y.O. (1998), "Earth, science and safety", brochure on reducing the impact of disasters, UNDP/UNESCO/IIIES.

- Izadkhah, Y.O. and Hosseini, M. (2003), "Reducing pre-school children's stress in earthquake preparedness through proper education", paper presented at The VIII European Conference on Traumatic Stress, Berlin, 22-25 May.
- Izadkhah, Y.O. (2004), "Bridging the generations, a critical assessment of disaster education in the development of a seismic safety culture in Iran", PhD dissertation, Cranfield University, Cranfield.
- Kaji, H. (1992), "School education for earthquake disasters: Japanese experiences", Training and education for improving earthquake disaster management in developing countries. Meeting Report Series, No. 57, UNCRD, pp. 115-20.
- Kibble, D.G. (1999), "A survey of LEA guidance and support for the management of crises in schools", *School Leadership & Management*, Vol. 19 No. 3, pp. 373-84.
- Kuban, R. (1992), "Disaster preparedness and crisis management: a school perspective", *Emergency Preparedness Digest*, Vol. 19, pp. 11-14.
- Kuban, R. (1993), "Preparing schools for disaster", available at: www.iacd.oas.org (accessed October 2003).
- Milutinovic, Z.V. and Trendafiloski, G.S. (1998), "Earthquake preparedness of schools in Republic of Macedonia", *Proceedings of the Eleventh European Conference on Earthquake Engineering, AA Balkema, Rotterdam*.
- Municipality of Anchorage, Department of Public Works (1995), "Building safety Div., earthquake preparedness: planning guidelines for schools", Vol. 1, Anchorage, Alaska.
- NETC (1992), *Earthquake Safety Program for Schools*, Vol. 1, Emergency Management Institute, National Emergency Training Centre, FEMA, Washington, DC.
- Ohmachi, T., Toshinawa, T. and Urabe, T. (1990), "Current state of earthquake preparedness of primary and secondary schools in Japan", *Proceedings of the Eighth Japan Earthquake Engineering Symposium*, Vol. 2, Paper 370, Japanese Society of Soil Mechanics and Foundation Engineering, Tokyo, pp. 2217-22 (in Japanese).
- Pearce, L. (2003), "Disaster management and community planning, and public participation: how to achieve sustainable hazard mitigation", *Journal of the International Society for the Prevention and Mitigation of Natural Hazards*, Vol. 28 Nos 2/3, pp. 211-28.
- Quarantelli, E.L. (1985), *Organisational Behaviour in Disasters and Implications for Disaster Planning*, Report Series 18, The Disaster Research Center, University of Delaware, Newark, DE.
- Ross, K.E.K. (1989), "Disaster preparedness: the place of earthquake education in our schools", *Proceedings of the Conference on Disaster Preparedness Held at Buffalo, New York, 9-11 July*.
- Rowling, L. (1999), "The role of policy in creating a supportive social context for the management of loss experiences and critical incidents in school communities", *Illness, Crisis and Loss*, Vol. 7 No. 3, pp. 252-65.
- UNCRD (2002), *School Earthquake Safety Initiative*, SESI project, available at: www.hyogo.uncrd.or.jp/activity/projects/04sesi.htm
- UNCRD (2004), "Reducing vulnerability of school children to earthquakes", available at: www.hyogo.uncrd.or.jp/whatsnew.htm (accessed December 2004).
- (1990), "Disaster management planning", UNDP Manual, UNDP, New York, NY.

About the authors

Mahmood Hosseini is Director of Structural Engineering Research Centre and the Head of Lifeline Engineering Department at the International Institute of Earthquake Engineering and

Seismology (IIIES), Iran where he has been working since 1991. His main field of work is structural dynamics and earthquake engineering, while contributing to several research projects related to earthquake risk mitigation issues. He has authored/co-authored more than 80 research papers, some of which has been published in international refereed journals. Mahmood Hosseini is the corresponding author and can be contacted at: hosseini@iiies.ac.ir

Yasamin O. Izadkhah is Research Associate in Humanitarian Resilience Centre in Cranfield University. She has been working in the International Institute of Earthquake Engineering and Seismology (IIIES) since 1990 (in leave). Her main field of interest is disaster management, children and disasters, disaster education, and public awareness and preparedness. She is the author/co-author of 22 research papers presented and published in national and international conferences, bulletins and journals. Yasamin has been the Production Manager of the JSEE journal since 1998. E-mail: Y.O.Izadkhah@cranfield.ac.uk