Awareness of preparedness in institutional buildings of developing countries for a disaster

Majid Ali[1]

1. Corresponding Author. Associate Professor, Department of Civil Engineering, Capital University of Science and Technology, Islamabad, Pakistan.
Email: majid.ali@cust.edu.pk

Abstract

Buildings have to face disasters (e.g. earthquakes or fire) during its life span. Proper preparedness can help in saving human lives. This becomes more important when the structure is an institutional building because of large number of students in day time. In October 2005, a whole generation lost its life with destruction of school buildings in Kashmir Pakistan. Therefore, a proper strategy is needed for planning preparedness in institutional buildings of developing countries. The overall objective of the societal research program is to bring the attentiveness level of all shareholders (i.e. 'policy makers', 'rescue organizations' and the most important 'public') of developing countries up to the international standards so as to have full preparedness. The particular aim of this work is to suggest further improvement after analysing the impact of remedial measures in improving the behaviour of students, staff and faculty in institutional buildings during day time. These measures include modifications in existing infrastructure, identifications of efficient evacuation routes, training of students, staff and faculty, monitored drill and student feedback. A mock drill was conducted and monitored through CCTV cameras to check the behaviour of trained students. At the end, recommendations are made in order to further improve the preparedness.

Keywords: evacuation, institutional buildings, preparedness, disaster, earthquake

1. INTRODUCTION:

Earthquakes and their subordinate risks had claimed the highest number of human lives of all huge natural disasters in recent years. Some of the most seismic-prone regions around globe are also areas of dense population (Mitchell et al. 2017). Around 86,000 people killed and over 80,000 severely injured along with extensive destructive effects during Kashmir Earthquake 2005 on October 8 (Mulvey at el. 2008). Peiris et al. (2006) reported deaths of 18095 school children and 853 teachers. It is important at one side to have earthquake-resistant structures and at second side to educate people about how to react during and after disasters? Community empowerment has been recognized as an important aspect in overcoming problems during and after disaster. Community empowerment is basically "*the process of enabling communities to increase control over their lives*" (Talib et al. 2018). Valenzuela et al. (2017) studied the impact of conventional and social media (television and twitter, respectively) for disaster news sharing, which could also be a source of educating communities about how to react? Television was once a powerful source of information and education. It was found that the social media (twitter) had succeeded among educated people (journalist) due to its quick valuable information. The same (social media) can be used for educating the communities.

In addition, there are different models for disaster management proposed by researchers and agencies. Nojavan et al. (2018) reported that despite their effectiveness in some places (i.e. developed countries), disasters are still a vital challenge at other sites (i.e. developing countries). It was concluded that three categories, i.e. hazard assessment, risk management and management actions, are important to reduce disaster problems. Oloruntoba et al. (2018) proposed framework of key activities and processes in the preparedness and recovery phases of disaster management. Here, the discussion is limited to preparedness phase due to relevance of current study. Three points are important in preparedness. First, proactive approach is better than reactive approach. Both officials and community should be involved in preparedness activities. Second, officials must not merely use option of "early warning". Instead, community should be asked to do actions like when to evacuate. How to evacuate and where to reach should be trained as a safe measure in proactive approach. Third, declaration to evacuate by alarm should be backed by a higher official so as to have impression of "just do it". Sekendiz et al. (2018) emphasized to bridge gap between policy and practice in emergency preparedness for reducing possible loss during disaster.

In a previous study (Ali 2017), the significance of health and safety trainings on students (i.e. how to respond during a disaster?) was analysed. The whole execution was done in Capital University of Science and Technology, Islamabad, Pakistan. The task was bifurcated into five phases: alterations in existing infrastructure, training of staff, educating the engineering students only, monitored drill (first drill) and student feedback. Certain recommendations were made. In this current work, certain recommendations are implemented over a period of one year and the mock drill is again conducted to check its effectiveness. Implemented recommendations include additional alterations in existing infrastructure, identifications of efficient evacuation routes, and training of all students, staff and faculty. Further improvement is suggested after analysing the impact of implemented recommendations for improving the preparedness in institutional buildings.

2. METHODOLOGY:

2.1 Background:

University emphasis on health and safety of students, faculty and staff. University has 10 buildings (A to J), one room for generator and two buildings as canteens. Four structures (one building, generator room and two canteens) has ground floor (G) only. Among 09 buildings, 05 buildings have four floors (G+3), 02 buildings have three floors (G+2) and 02 buildings have two floors (G+1). So, there is a total of 34 floors which need to be systematically evacuated keeping in mind the disaster nature. In December 2016 (time of first ever mocked drill), there was a total student strength of 3713 and employees (faculty and staff) of 301. During peak hours (i.e. 8 am to 4 pm), around 2500-3000 students, faculty and staff were present in the university campus. Well before first ever mocked drill, certain steps were ensured. These included building evacuation planning, identification of assembly areas, testing of bells and alarms, and training of staff/faculty. To start with, only engineering students were trained about how to behave during disaster? For the first ever drill, students and faculty were not informed at the time of ringing bells and alarms. Only few employees knew about the drill who were monitoring it. A total of 47 theory classes and 04 lab classes were in progress. All buildings were evacuated in 6-8 min. All were asked to stay in assembly area and then were sent back to resume classes. After few weeks, student feedback was taken and analysed. Also, observed flaws were noted. The details of this exercise were presented in Ali (2017). Recommendations were also made for improvement.

Certain recommendations of Ali (2017) are implemented over a period of one year in Capital University of Science and Technology, Islamabad, Pakistan. Also, students are trained from all departments. In December 2017, mocked drill is repeated and the results are presented in this current study.

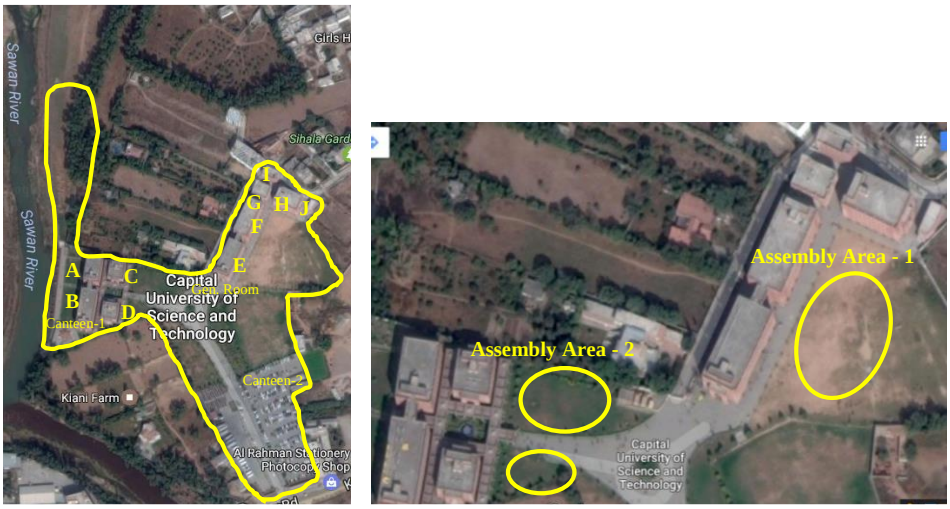

Figure 1: University campus (left picture) and assembly areas (circles in right picture) [Ali (2017)]

2.2 Implemented recommendations:

2.2.1 Additional modifications in existing infrastructure:

Boards showing the identification of assembly areas were displayed at appropriate locations. This could be observed by any one passing-by assembly areas. Number of exit signs were enhanced in each building. Evacuation plans were displayed in proper

frames so as to have the permanent feature of buildings.

2.2.2 Identifications of efficient evacuation routes:

All the evacuation routes were reviewed after one year of its first placing at their locations. Evacuation exercise of first mocked drill and real evacuation during earthquake of October 2017 were kept in mind. In few cases, evacuation routes were made efficient by dispersing half of occupants on one side and remaining on other side. It was also observed that evacuation routes were missing on few floors and even it was not prepared/displayed for few floors.

2.2.3 Training of all students, staff and faculty:

An effort was made to train all students, staff and faculty. For this purpose, committee members were enhanced from engineering departments only to all departments offering undergraduate programs. Added members were briefed about vision of committee and requested to form departmental teams. New onboard members were trained so that students of their department could get training from them. In spite of all efforts, all undergraduate students of university could not get training just because of limited time.

2.3 Mocked drill and student feedback:

Just like first drill, nobody was informed for second mocked drill in December 2017. Only persons involved in drill monitoring were taken in to confidence. Around 50 theory and lab classes were in progress. At around 10:39 am, bells and alarms were on.

The student feedback performa, used in Ali (2017) and current study, is given in Figure 2. There is a total of ten questions including some tricky questions like Q4 and Q8. CUST ambulance was used to rescues any mocked injured (Q4) and fire brigade was not called (Q8). The questions were set to check the seriousness of students in giving feedback and reliable feedback could really help in improving effectiveness. An effort was made to collect student feedback two months after the drill. Feedback was taken after two months for current study because, in Ali (2017) study, difficulty was observed to take feedback from students especially in last teaching week.

A. Please provide the following information:

Your Department	*Your Semester*	*Your Auditorium at Time of Safety Drill*

B. Please answer the following (Please tick any one "Yes" or "No"):

Sr. No.	Question	Answer	
		Yes	No
1	Were you given safety training "how to behave during any natural disaster"?		
2	Had you observed discipline during the safety drill?		
3	Was your response quick in evacuating the building?		
4	Had you observed CUST ambulance rescuing the injured?		
5	Had you attended the next class at 11 a.m. after safety drill?		
6	Were the volunteers guiding during the safety drill?		
7	Was the conduct of safety drill a good step?		
8	Had you seen the fire brigade during the safety drill?		
9	Will you behave in a discipline manner during real earthquake in future?		
10	Do you recommend conducting safety awareness trainings/seminars?		

C. Any suggestion.

Figure 2: Student feedback performa used in Ali (2017) and current study

3. RESULTS:

3.1 Response of students:

Student response during mocked drill was observed through live observations and CCTV cameras. All classes were in progress at around 10:39 am when the bells and alarms were rung. All persons reacted and started evacuating within ½ to 1½ minutes. For response of any class, three CCTV cameras were utilized: one in class room, one in the corridor and one for the assembly area. It may be noted that few classes were on the fourth floor. In most cases, teachers started evacuation, but in few cases, floor volunteers requested teachers to start evacuation. Around within 5-6 minutes, all buildings were evacuated. All people were kept in assembly areas for 15 minutes, then were requested to go back for resuming classes. The overall response of students was better in second mocked drill than during the first drill. It may be noted that the response time during second drill was around ½ to 1½ minutes and the exit time was around 4½ to 5½ minutes. Figure 3 shows response of students, staff and faculty: a bad example from Ali (2017) [left photo], and a relatively good example from current study [right photo]. In left photo, few students gathered around teachers for marking of attendance when bell was rung (students were supposed to leave class and to move in hurry to nearest assembly area). In right photo, all students left class and moved in hurry to nearest assembly area, but teacher was not in that much hurry.

Figure 3: Response of students, staff and faculty: a bad example from Ali (2017) [left photo], and a relatively good example from current study [right photo]

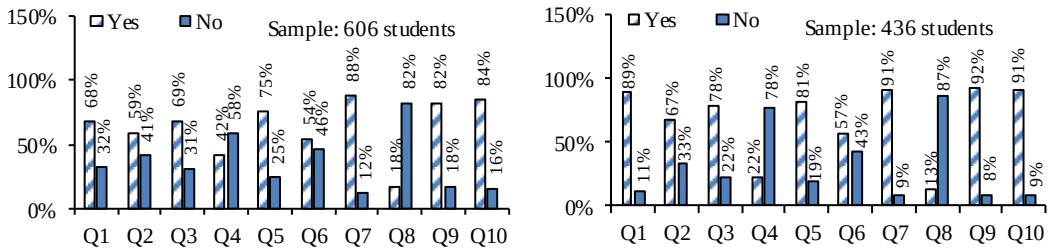

Figure 4: Analysis of student feedback: left graph from Ali (2017), and right graph from current study

3.2 Analyses of student feedback:

A total of 606 and 436 students gave feedback for Ali (2017) and current study, respectively, (Figure 4). Students of all departments were involved for their feedback. Generally, the feedback in current student is relatively better when compared to that of previous study. However, the responses to questions Q4 and Q8 indicate that the behavior of students still needs to be improved. Most of the students left empty section C of feedback form, few gave irrelevant comments, few appreciated this effort and very

few gave constructive suggestions. These suggestions include improving student's behavior in such events, conducting more frequent trainings, and involving more student volunteers. It was ensured that 100% engineering students were trained. But around 28% and 10% engineering students answered "NO" in getting training in Ali (2017) and current study, respectively. A considerable improvement is seen, but still it needs to be further improved through training and awareness.

3.3 Observed flaws:

Such kind of drills can help in identifying the flaws for further improvement. Based on analysis of uninformed drill (monitored through CCTV cameras) and student feedback, following flaws were were observed:

I. Training of all undergraduate students was not conducted.
II. Few students, staff and faculty were still not taking seriously SOP guidelines. It should be made clear to all that nothing is not important than life.
III. Few volunteers could not perform well for efficient evacuation of buildings.
IV. Intensity and tone of the bells and alarms need further improvement in terms of siren, tone and loudness.

Sekendiz et al. (2014) also reported lack of emergency preparedness in many fitness facilities in Australia. Emergency evacuation procedures, emergency response plans or emergency telephone numbers were not clearly displayed in most facilities. Even first aid box was not accessible by all staff.

4. CONCLUSIONS AND RECOMMENDATIONS:

Certain recommendations of previous study by Ali (2017) are implemented over a period of one year and the mock drill is again conducted to check its effectiveness in Capital University of Science and Technology (CUST), Islamabad, Pakistan. Implemented recommendations include additional modifications in existing infrastructure, identifications of efficient evacuation routes, and training of all students, staff and faculty. Following are the conclusions from current study:

- Implemented recommendations of previous study has a great positive impact in bringing the preparedness up to satisfactory level i.e. people response is improved for emergency evacuation.
- Building evacuation time reduced from 6-8 minutes to 5-6 minutes due to awareness, trainings, and identification of efficient evacuation routes.
- The commitment of university higher management to ensure the safety of its students and employees is a major key factor for well preparedness.

Based on current work, following are suggestions for further improving the preparedness in CUST in addition to already available facilities:

- Maintain the practice of trainings and awareness of students, volunteers, staff and faculty in order to further reduce the building evacuation time. Trainings can be made more efficient by involving professional trainers.
- Alarm system should be made centralized.

Such kind of studies are good examples to be followed by other institutes in developing countries. Furthermore, institute officials should ensure well preparedness for any kind of disaster to have minimum loss.

ACKNOWLEDGEMENTS:

The authors would like to thank every person who helped throughout the research work, especially Engr. Tasaddaq Hussain, Engr. Sohail Afzal, Engr. M. Rizwan Javed, Ms. Humera Aftab, Dr. Mariam Bakhtiar, Engr. Dr. Khawar Naveed and Mr. Umar Toor. The efforts of all volunteers, involved in executing drill, are gratefully acknowledged. The careful review and constructive suggestions by the anonymous reviewers are gratefully acknowledged.

REFERENCES:

Ali, M. (2017). Evacuation of institutional buildings during a disaster in developing countries: From planning to implementation phase. Annual New Zealand Earthquake Engineering Society Conference, Wellington, New Zealand, April 26-28. Paper 0220.

Mitchell, D., Grant, D., Roberge, D., Bhatta, G. P., and Caceres, C. (2017). An evaluation framework for earthquake-responsive land administration. Land Use Policy, Vol 67, pp 239-252.

Mulvey, J. M., Awan, S. U., Qadri, A. A., and Maqsood, M. A. (2008). Profile of injuries arising from the 2005 Kashmir earthquake: the first 72 h. Injury, Vol 39, No 5, pp 554-560.

Nojavan, M., Salehi, E., and Omidvar, B. (2018). Conceptual change of disaster management models: A thematic analysis. Jàmbá: Journal of Disaster Risk Studies, Vol 10, No 1, pp 1-11.

Oloruntoba, R., Sridharan, R., and Davison, G. (2018). A proposed framework of key activities and processes in the preparedness and recovery phases of disaster management. Disasters, Vol 42, No 3, pp 541-570.

Peiris, N., Rossetto, T., Burton, P., and Mahmood, S. (2006). EEFIT mission: October 8, 2005 Kashmir earthquake. Published Report, The Institution of Structural Engineers, London.

Sekendiz, B., Norton, K., Keyzer, P., Dietrich, J., Coyle, I. R., Jones, V., and Finch, C. (2014). An evaluation of emergency plans and procedures in fitness facilities in Australia: implications for policy and practice. In Proceedings of the 5th International Disaster and Risk Conference (IDRC 2014) (pp. 633-636). Global Risk Forum (GRF).

Sekendiz, B., Norton, K., Keyzer, P., Dietrich, J., Coyle, I. R., Gray, S., and Finch, C. F. (2018). Emergency preparedness in fitness facilities: bridging the gap between policy and practice. International Journal of Business Continuity and Risk Management, Vol 8, No 1, pp 71-85.

Talib, I.F.A., Takim, R. and Mohammad, M.F. (2018). Community empowerment through rehabilitation and reconstruction in social sector of Kuala Krai, Kelantan, Malaysia. Procedia Engineering, Vol 212, pp 294-301.

Valenzuela, S., Puente, S., and Flores, P. M. (2017). Comparing disaster news on Twitter and television: An intermedia agenda setting perspective. Journal of Broadcasting & Electronic Media, Vol 61, No 4, pp 615-637.