

EARTHQUAKE RISK PERCEPTION OF STAKE HOLDERS INVOLVED IN HOUSING SAFETY IN PAKISTAN

Ghazala Naeem*
MEE07155

Supervisor: Dr. Kenji Okazaki**

ABSTRACT

Pakistan is vulnerable against potential seismic risk and has recently suffered from the disastrous earthquake in October 2005 causing enormous human and economics losses. In this study, after an outline of seismicity of Pakistan, damages by the 2005 Kashmir earthquake and consequent reconstruction activities, results and analysis of a survey conducted among all stake holders involved in housing construction are presented. The survey consisted of various questions on seismic risk perception of house owners (residents), house builders/ head masons, central and local government officers. As resident's survey was conducted in two different communities, one was severely affected and other was not damaged by the 2005 Kashmir Earthquake, their responses are different about earthquake risk perception but similar for mitigation efforts. Some similar outcomes were found in case of survey analysis of builders/ masons, central and local government officers. The 2005 Kashmir Earthquake has triggered the consciousness among all stake holders in Pakistan especially people who have either suffered the disastrous consequences of the earthquake or have been involved in post earthquake relief and rehabilitation activities in affected areas. This potential needs to be utilized in an optimum way as such memories can be faded away quickly.

Some suggestions, to improve housing safety based on the analysis are proposed to raise disaster mitigation awareness and disseminate information regarding safer technologies effectively, to communities. This study may be helpful while planning mitigation programs and public awareness campaigns on preparedness in Pakistan and areas with similar characteristics.

Key words: Earthquake risk perception, housing safety, disaster reduction

BACKGROUND AND METHEDODOLOGY

The 2005 Kashmir Earthquake demonstrated the extent of damage, an earthquake can cause in Pakistan. Given to Pakistan's seismo-tectonic setting, this earthquake is not a one time event, but a part of sequence of earthquakes that happened in the past and will happen in the future. Most seismically active areas are north, northwestern and western sections of the country along the boundary of the Indian Tectonic Plate with Iranian and Afghan Micro Plates. The number of fatalities and injuries exceeds 73,000 and 125,000, making it by far the most fatal earthquake ever to occur in the Indian subcontinent or its surrounding plate boundaries. Most of the deaths were caused by the collapse of buildings that were not adequately designed for earthquake resistance,

* Earthquake Reconstruction and Rehabilitation Authority, Pakistan

** Professor, National Graduate Institute for Policy Studies, Japan

were poorly constructed using stone, fired brick or concrete blocks using mud or cement mortar. In 1935 a Richter magnitude M7.5 strike-slip earthquake near the city of Quetta (the only large settlement in an otherwise sparsely populated region between Afghanistan and Pakistan) resulted in an estimated 35,000 dead.

In Pakistan mostly buildings have been procured by the owners themselves by employing unqualified and unskilled contractors/ masons for saving cost as for ordinary private construction there is no legal frame work for licensing requirement of contractor. It is evident that there has never existed an effective building monitoring mechanism. Even in cities municipal organizations do not have the institutional capacity for the strict implementation of the code for building construction, making almost all the building stock inappropriate especially, for a seismic region. .

The 2005 Kashmir Earthquake proved the vulnerability of housing stock and fatal consequences which lead to a realization of safer houses in Pakistan. During past three years of reconstruction activities in earthquake affected areas, national and international organizations are making efforts to ensure safety of post earthquake construction of the affected areas. Therefore, this study aims to analyze hazard-related human behaviors to identify the factors that determine the understanding and interpretation of the people: how the people perceive seismic risks, how such risk perception would be biased by economic and social aspects, how they would like to avoid such risk, using social survey data carried out in Pakistan, involving key players for earthquake safety i.e. residents, government officials and house builders / head masons.

This survey was conducted in 2007 as a part of Collaborative Research and Development Project for Disaster Mitigation under the program of Building Research Institute (BRI), Japan and National Graduate Institute for Policy Studies (GRIPS) Japan, using the questionnaires developed by Dr. Kenji Okazaki (GRIPS). All interviews were carried out by visiting interviewees in their houses and work places through face to face communication and questionnaires were filled by the surveyors according to the answer of the respondents. As there has been no such survey on earthquake risk perception of communities and other stake holders concerned with housing safety in Pakistan, outcome of the research will be beneficial to the experts and policy makers while planning mitigation programs and public awareness campaigns on preparedness and mitigation for the regions with similar characteristics.

SURVEY DATA AND ANALYSIS

Residents

A total of 800 households were surveyed from two different communities each represented by a village having distinct characteristics, one lies in the high seismic zone severely affected by the 2005 Kashmir Earthquake (village Panyali, District Bagh) and the second lies in the zone which has a very low seismic activity and has practically seen no earthquake activity (village Kamman, District Okara). This choice of two regions separated by distance and experience of disasters was to study the perception of the two people about disaster in general and earthquake disasters in particular. Respondents were asked questions to know how they perceive seismic risk like: whether they think their house is safe against earthquakes, how they want to avoid the risk of damage to their house and to their family, what they know about retrofitting etc., in addition to the questions about their sex, age, number of family members, household income, occupation, academic qualification, and house related information such as floor area, type of house, cost and ownership.

In both communities, 96% respondents were males because of socio-cultural restrictions imposed on women's social participation and mostly respondents belong to age group between 30-60 years. Most of the total population (85%) has either school education or cannot read /write at all, although in Panyali academic qualification level is higher than Kamman and comparatively better occupations. Average house hold size in Panyali and Kamman are 6.4 and 7.8 respectively. Almost

all houses are self/ family owned having floor area more than 200 sq m because of living styles and type of houses. Respondents in Panyali are staying longer period in the same house i.e. more than 50% are living between 25 and 50 years in the same house. In Kamman almost 70% people are living less than 25 years period. In terms of house type, both communities have independent houses because of socio-cultural trends and environmental requirement in Pakistan. There is a general trend in Pakistan of building the house by hiring mason or a local builder (labor contractors); therefore both surveyed communities mostly have self built houses built by the local mason / house builders (85%-96%). Cost comparison of self built houses shows Panyali has a larger percentage of house built with less cost than in Kamman. Use of locally available stones with mud mortar is a major construction material in Panyali, resulting low cost of construction as compared to plain areas like Kamman where mostly houses are built with burnt brick using cement mortar.

In response to the question about any disaster experienced in life before, almost respondents in Panyali have experienced recent 2005 Kashmir Earthquake whereas in Kamman 73% have experienced flood because of being flood prone region. Majority of respondents in Panyali (76%) consider disaster as most affecting event because all of them have experienced the 2005 Kashmir Earthquake and its aftermaths where as in Kamman 33% considers unemployment, 27 % disaster and 25% disease. Overall 84%-88% people think that a future earthquake can cause loss of lives, injuries and loss of properties as well. In both communities almost all respondents consider their houses unsafe against a big earthquake. More than half of the Panyali respondent relies on masons/carpenters whereas almost same percentage in Kamman depends on government for safer construction. Almost 50% of overall population considers use of poor construction materials/ works as the major cause of the house collapse in case of a big earthquake. It seems that mostly Panyali residents are aware of the technical flaws about weak construction of their houses which had caused swerve damage to life and property by the 2005 Kashmir Earthquake. Mostly people (96%) are unaware of the available techniques of strengthening their houses. Similarly, respondents have estimation for cost of strengthening the house against earthquake either equal or even many times the cost of self built house within groups of low cost houses which seem to be unrealistic. On the average almost 80% respondents are ready to spend more than five years of their income to protect their house/ property from big earthquake. Almost 40% Panyali respondent have plans either to build/ purchase an earthquake resistant house or strengthen their existing house by retrofitting. In Kamman this percentage is relatively lower i.e. 32.7%. A large portion of the Kamman population (40%) has all together no plan for safer house but in Panyali only 2.3% people fall in this category. A great majority of Panyali residents (63%) are aware of the organization working for disaster risk reduction in their area and mostly they have participated in community based disaster reduction activities as compared to Kamman respondents who mostly don't know about any such organization. The significant difference in responses can be attributed to ongoing reconstruction and mitigation activities in earthquake affected area therefore mostly Panyali residents have participated in community activities for disaster risk reduction.

Findings

For most affecting event, disasters are considered to be the priority event by most of the residents but it can be noticed, there is a general high tendency of this response with the increase in income and academic qualification levels (Figure 1 & 2). Earthquake is considered to be the most affecting disaster within high income and academic qualification groups as seen in Figure 3 & 4. Similarly, people having high income level and school, college and university education have relatively better tendency towards retrofitting the house, considering their present house not strong enough to resist big earthquakes (Figure 5 & 6).

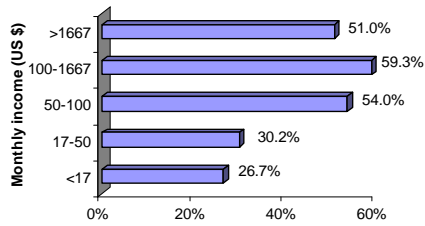


Figure 1: Monthly income disaster as most affecting event

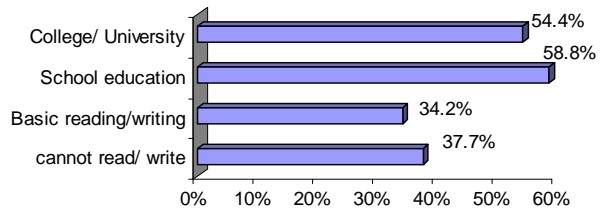


Figure 2: Academic qualification & disaster as the most affecting event

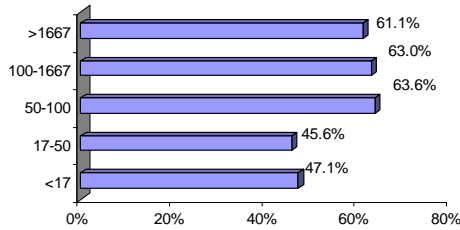


Figure 3: Monthly income and earthquake as the most affecting disaster

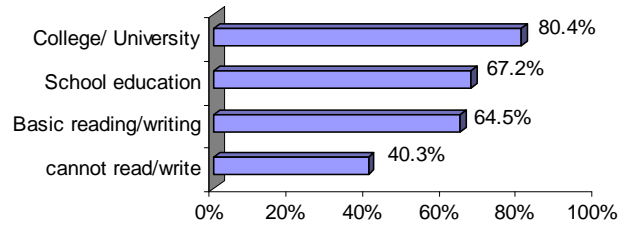


Figure 4: Academic qualification and earthquake as the most affecting disaster

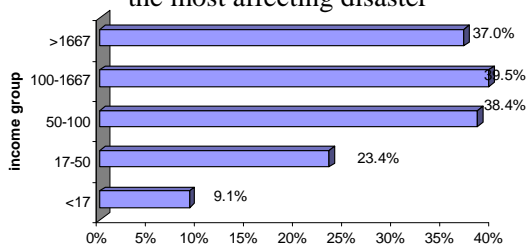


Figure 5: Relation between income group and respondent who have retrofitted the house

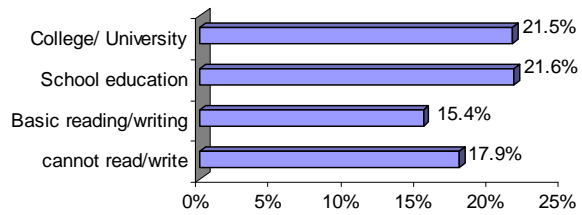


Figure 6: Academic qualification and retrofitting as the plan for safer house

Composition of respondents considering strengthening cost of their houses ranging between US \$ 3333-8333 and more in relation to cost of self built house is presented in Figure 7 which shows that tendency of estimated strengthening cost more than US\$ 3280 is more within group with high cost of self built house. Although in most cases, estimated such cost is either equal or more than the actual cost of the respondent's house even less initial cost.

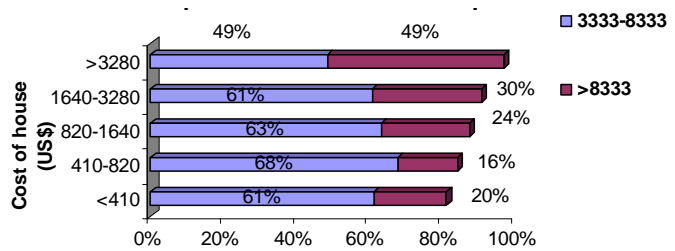


Figure 7: Cost of house and expected cost of retrofitting

House Builders/ Head Masons

Total of 37 house builders and 13 head masons were interviewed from Islamabad, Lahore, Faisalabad, Multan, Sahiwal and some interior villages of Punjab and Northwestern Frontier province working in various companies and groups. Only two builders were qualified engineers and the rest have ten years of school education whereas most of masons have basic reading and writing skills. Mostly builders/ head masons (94%) provide services either on labor contract or labor and material contract. Builders and masons who think that most contributing factors to loss of lives in

case of earthquake would be house collapse is almost 90%. Response to this question shows the awareness of the builders about the vulnerability of dwellings people are living in. Only 4 % builders/ masons have received any formal training about earthquake resistant construction because in Pakistan there is no system or law of licensing, registration or training of builders/ head masons. Similarly, about using building code or construction guidelines, 28 % builders/ head masons have been applying its provisions in building construction and the rest 72 % have either never heard about such details or just heard but don't know details. There are 4% of builders/ masons who know these details but not using in construction considering impractical. It is important to mention that for ordinary house construction there is no legislation for application and adoption of building code neither in design nor in construction practices. Majority of respondent (38%) expect government to develop a proper licensing system and carry out training programs on earthquake resistant construction, to ensure trained masons. One of the major difficulties that 17 builders/ masons mentioned is homeowners resist as they don't want to pay extra cost for making an earthquake resistant house. Almost 38 % of overall respondents consider retrofitting feasible; on the other hand 42 % are those who either consider retrofitting impossible or not viable. The rest 20% don't know about retrofitting at all. These responses give a clear picture of the lack of awareness of builders/ masons about retrofitting who are responsible for construction of 90 % houses.

Central Government Officers

Total of eight officers were interviewed who are well aware of the aftermaths of the 2005 Kashmir Earthquake as most of them are directly or indirectly involved in reconstruction and disaster management activities or policy making. Almost half of the respondents anticipate immediate threat whereas the others either don't know or do not anticipate a near future earthquake. Except two officers who do not have any idea about highest anticipated loss of lives all others anticipate casualties in millions and thousands, in case of a future earthquake. As majority considers poor construction of buildings as the most contributing underlying factor to earthquake disasters in Pakistan and the main causes for vulnerable building stock are ranked as lack of building enforcement system, economic conditions of people leading not to be able to afford good material and technology, lack of awareness among public and lack of appropriate technical know-how. Considering the available resources/capacity and prevailing risk situation four of the officers prioritize need for building code enforcement as the pre-disaster measures for the earthquake safety whereas the rest give priority to other risk management policies. Further, they recommend strong legislation, public awareness scheme, training of building control staff and financial support to house owners for effective implementation of building control system in the country.

Local Government Officers

Twenty five Local government officers working in different cities and districts of province Punjab, Azad Jammu and Kashmir and Northwestern Frontier Province, have been interviewed. Officers working in Punjab face flood as frequent disaster in the area of their domain whereas others have experienced the 2005 Kashmir Earthquake and/or participated in relief and reconstruction activities. Local government officers who expect a big earthquake within few years and within ten years constitute 48% and all officers anticipate large casualty and buildings collapse in case a big earthquake hit the area. Two third of the respondents believe that vulnerable building stock due to bad construction practices, is the most contributing earthquake risk factor to city. Almost 20% considers lack of mitigation efforts and 8% opted for the vulnerable life line structures, in this regard. Further majority of the officers (56%) believe that homeowners cannot afford to have good materials and utilize earthquake resistant technologies, which is the most critical cause for

vulnerable building stock. Whereas 28% believe, lack of appropriate technical know how and inaccessibility to such techniques of the house owners are the critical causes for vulnerable buildings. All officers believe that a building permit system exists in their cities principally and building code implementation is supposed to be a part of that system but unwillingness of the public to follow the building code is the major issue for effective implementation of the building code. Most of them believe that builders/petty contractors and masons can contribute more to improve building safety as most of the housing stock is constructed by them.

CONCLUSIONS

The study has revealed a clear difference in perceptions about future earthquake risks and minor differences in mitigation efforts done so far or planned to do in future, between people of the two areas perception; one which was hit by the earthquake having relatively high risk perception as compared to other which is quite far from the earthquake prone area. Similarly finding of the survey shows there are different level of understandings of people belonging different income groups, academic qualification and disaster experience. Therefore, objectives of awareness raising should differentiate between target groups focusing their understanding level, role and importance in housing construction, affordability, accessibility and acceptability. The 2005 Kashmir Earthquake has created a consciousness among all stake holders involved in housing construction in Pakistan. This potential needs to be utilized in an optimum way as people can forget such experiences very quickly. Therefore it is necessary to preserve data, facts and lesson learnt by the earthquake to communicate and disseminate knowledge and wisdom gained with communities. For this purpose, an institute is proposed which can share the effects of the 2005 Kashmir Earthquake and promote disaster risk mitigation within communities following the pattern of Disaster Reduction Institute (DRI), Kobe which offers programs by which visitors can learn the effects of the Great Hanshin-Awaji Earthquake and lessons learned from the experience that should be shared with younger generations. This gives inspiration to the visitors for realizing the disastrous impacts of earthquake and motivation to adopt measure for safer environments. Further, DRI is involved in research and training programs promoting social preparedness against possible major disasters in and outside Japan. These conclusions may be very helpful in planning mitigation programs and public awareness campaigns in Pakistan and regions with similar characteristics as well.

ACKNOWLEDGMENT

I would like to express my sincere gratitude to Mr. Masahiko Murata (DRI, Japan) and Mr. Najib Ahmed (Preston University, Pakistan) for providing useful data, support and cooperation during my individual study.

REFERENCES

- Kenji Okazaki, 2008, Study on Risk Perception concerning Housing Safety against Earthquake-EAROPH , Seismic Risk Perception of People for Safer Housing, 14th World Conference on Earthquake Engineering, 2008, Beijing, China
- Najib Ahmed, 2007, Report on Disaster Risk Reduction, Preston University
Websites, www.nha.gov.pk, <http://web.worldbank.org/>, , www.dri.net.jp, www.erra.gov.pk,