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Public Awareness about Earthquake Risk, Building Codes and its Enforcement in Quetta City:

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Abstract:

Quetta lies in high seismic risk zone which receive frequent earthquakes of various magnitudes. This unpredictable disaster will cause catastrophic situation in any future seismic event in the region. The main objective of this paper is to understand the public awareness about earthquake risk, building codes and its enforcement in Quetta. The data sample were collected from 400 houses by using simple random sampling. The results reveled that people have knowledge about earthquake risk but not satisfied by the role of government and concern departments in implementation of building codes in Quetta city. The article recommends design program to build public awareness about earthquake risk and concern authorities play their role to minimize the future effects of any seismic event in the city.

Keywords: Earthquake, Seismic Risk, Building Codes, Enforcement, Government Role, Quetta.

Introduction:

In few minutes, thousands of people killed in natural disasters and their repercussion even more over subsequent weeks and years. Worldwide around 60,000 people dead due to this unpredictable disaster, 90 percent of which are occurring in developing countries (OECD, 2008). These causalities and damages occur due to earthquakes where the building are not constructed according to seismic building codes (Kenny, 2009).

Poor construction of building with poor compliance of building code combine with inadequate land use practices which results in higher death rates in same magnitude of earthquake in the developing world (Jones & Vasvani, 2017). The Armenia earthquake of 1988 and Lolma Prieta quake

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of 1989 near San Francisco, the death toll in Armenia was 25,000 as compare to 100 in San Francisco. The Paso Robles quake of 2003 in California was same magnitude as Bam earthquake in Iran. The human toll was 41,000 in Iran and two in California. In the various studies of engineering analysis shown that the major difference of causalities was strict implementation of zonation and building codes in California as compare to Armenia and Bam (Kenny, 2009). The comparison of these countries indicates that high human toll and fatalities occurred in developing countries due to lack of implementation of building codes.

In Pakistan, like other developing world, the seismic building codes implementation is a great challenge (Bilham et al., 2007), the large area of the country is situated in high seismic risk region where number of active faults lies. Balochistan, province of Pakistan where most active Chaman trust fault system exist, seems to be high seismic risk of damages by collapsing buildings particularly in urban areas (Ainuddin, Kumar Routray, & Ainuddin, 2014). Quetta, the provisional capital city of Balochistan where the previous and ongoing development activities increasing the threat of more damages in upcoming seismic events which turn into a threat for the residence of Quetta due to lack of adoption of building codes.

Poor implementation of seismic codes with fragile construction activities without any preparedness, has increasing the risk of people's vulnerability in future earthquake event (Jones & Vasvani, 2017). Building codes adaptation and implementation is consider most important tool in the protection of human lives and physical property in response to any major seismic event by reducing the community's risk (Adikari & Yoshitani, 2009; Ainuddin, Kumar Routray, et al., 2014).

Quetta, which lies in most high seismic zone of the Pakistan (Seismic Provisions, 2007) had experienced catastrophic earthquake in 1935, in which 35000 people were died, which count one of the major disasters event in world earthquakes history. The region has continually facing earthquakes of different ranges from 5 to7 Richter scale (PDMA,2006).

The first building codes developed after 1931 Mach earthquake (7.3 Magnitude) in which all the adobe structures were collapsed, after the details study conducted by Kumar published and developed a report, proposed first ever seismic macro-zoning map for sub-continent (Kumar,1933). After 1935 earthquake of Quetta, a new seismic building codes were developed and enforced by British Government in 1937, in which 8 type of building structures were proposed for the Quetta city. The codes are based on regulations which shape, spacing, height and material of

these eight type of building structures proposed (Ainuddin, Kumar Routray, et al., 2014; Naseer, Naeem Khan, Hussain, & Ali, 2010).

Pakistan prepared its first ever building codes in 1986, in which country was divided into five seismic zones, but the codes are not implemented successfully. After 2005 Kashmir earthquake, provision was made in 1986 building codes and introduced in 2007 with micro-zoning map of the country to minimize the risk of damages in any future seismic event but the codes are still on documents. With growing population and fragile construction of buildings without adopting proper seismic regulation, will become lethal weapon for the residents Quetta in any future earthquake.

Research Methodology:

The findings of the paper are based on both primary and secondary data sources, to analysis the general understating of the public about earthquake risk, building codes and its implementation in Quetta city. The secondary data sources were research articles, reports, policy documents from the various departments working on disaster management and online data base. Primary data collect from the house residents through questionnaire survey, in which most of the queries were based on earthquake risk, building codes awareness and its implementation.

Quetta city divided into two zones by National Engineer Service Pakistan (NESPAK) on the basis of seismic risk i.e. Zone A (Very High Seismic Zone) and Zone B (High Seismic Zone) (Ainuddin, Mukhtar, & Ainuddin, 2014). About 5 kilometer fault line count in very high earthquake risk zone (Zone A) which cover mostly those areas where most of the damages observed in catastrophic earthquake of 1935.

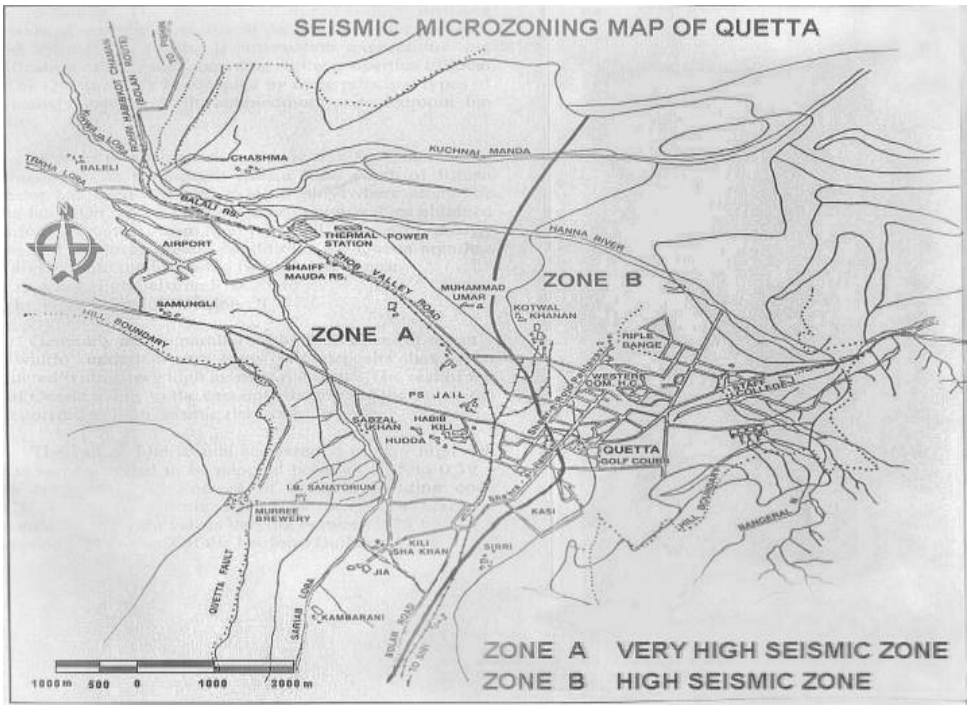
Fig. 1. Micro-Zonation Map of Quetta.

Based on total number of houses (276,711) in Quetta, the sample size derived by using Slovin's formula ($n= N/1+Ne^2$) with the 95% of confidential level for both zones. Approximately 400 sample were collected randomly from both zones (261 from zone A and 139 from Zone B). The data analyze through descriptive statistics.

1. Results and Discussion

1.1.Public awareness about earthquake risk and Building codes

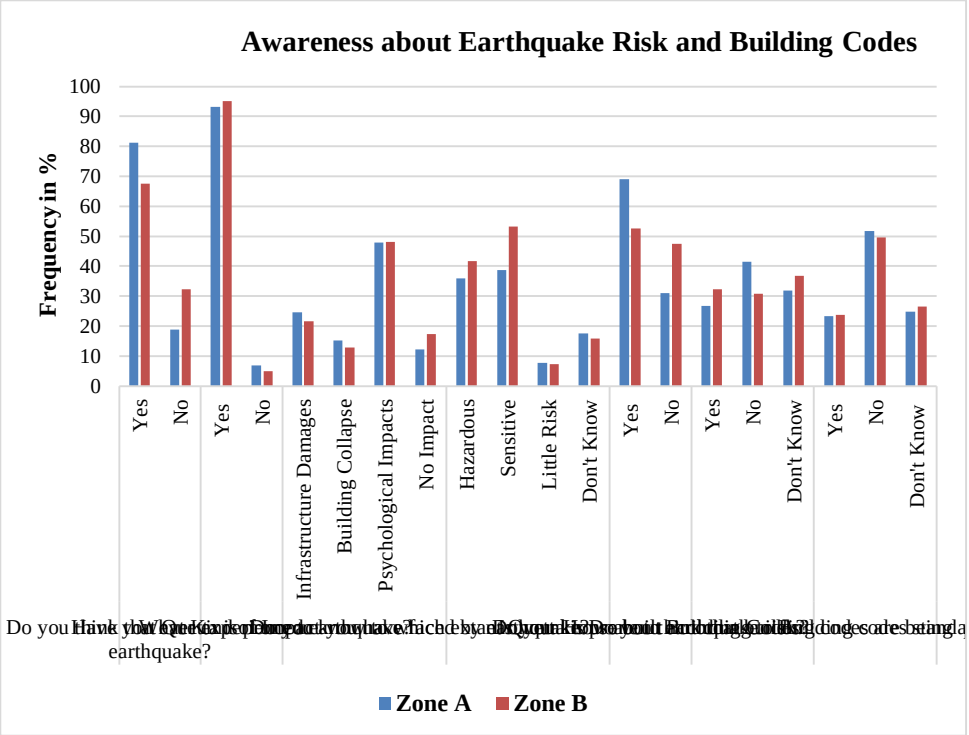
Based on questionnaire survey observation the data was collected from the respondents of both Zones (A and B) about the earthquake risk and building codes awareness. The questions were asked from both male and female respondents randomly in both Zones. The respondents were asked whether they know that Quetta is at earthquake risk? Have they ever experienced earthquake? Any impact faced during earthquake? and to which extant



Quetta is prone to earthquake? Do they know about building codes? Are the respondents' house built as per building codes standards? Do you think that building codes are being practice in Quetta city?

The results indicate that the low awareness about building codes and lack of adaptation of earthquake resistant building codes posing great risk in any future seismic event. People have little knowledge about building codes and future earthquake risk. From Zone A, 81.2% people have the knowledge that Quetta is prone to earthquake as compared to Zone B with 67.6%. In both Zones the people who had experienced any seismic event in their life have faced mainly psychological impacts (fig.2).

Moreover, the results reveled that respondents from both zones have not much information about basics of seismic proof building standards. The



results are alarming when they were asked whether they are following the seismic building standards and theses standards have been applying in residential and commercial development projects of the city. About 52% people think that building codes are not being practice in Quetta and 27% people have no knowledge about it (fig.2).

1.2.Public Awareness about Building Control Authority and Implementation of Building Codes in Quetta.

The residents of Quetta city do not have much knowledge about the existence of Building Control Authority (BCA) in Quetta, who is responsible for the inspection of buildings status and condition to cope with any seismic event. 22% people from Zone A and 31% from Zone B know about BCA and 96% people said that no authority has ever come to inspect their building existing condition and the remaining 4% who respond that BCA has inspected their house but do not share their views about the building status and not made any charges and obligations against them (fig.3).

Fig. 2. Primary field survey data

Furthermore, the public is concern about the buildings without proper implementation of building codes which are posing threat to their lives in any future seismic event. The respondents were not satisfied about the role of government departments and concern authorities who are responsible for the development projects in Quetta. 67% people stated that government is not seriously playing their role in implementation of building codes in high seismic risk zone, which may lead the city in catastrophic condition in any future earthquake (fig.3).

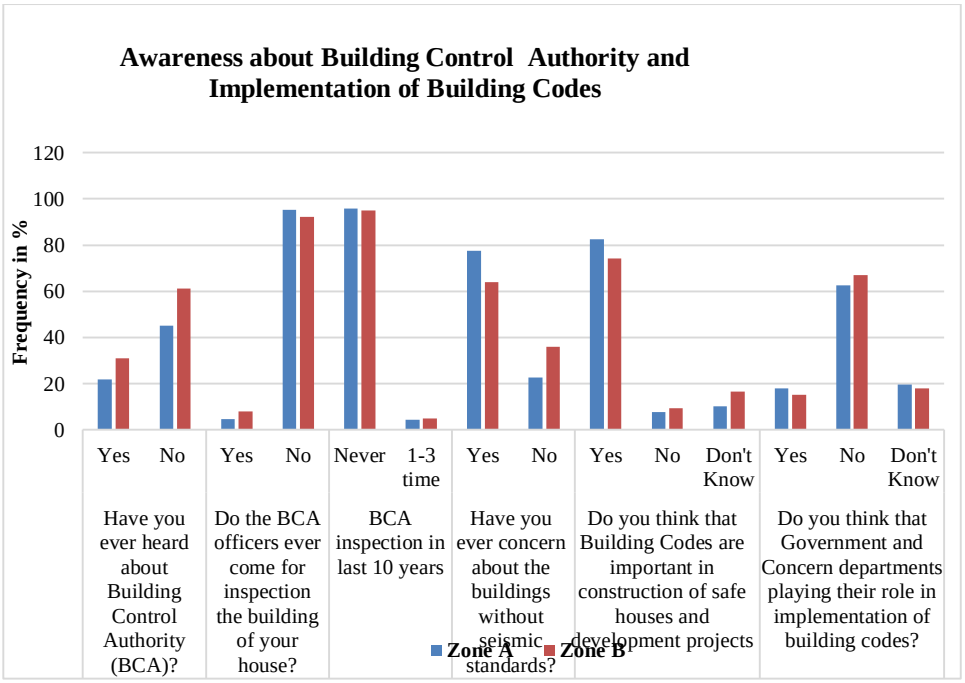


Fig. 3. Primary field survey data

Conclusions:

This research paper has aimed to understand the public awareness about earthquake risk, building codes, building control authority and government and concern department role in compliance of building codes in Quetta. The residents of the city have aware that Quetta lies in high risk zone. Public have not much knowledge about the building regulations, but they are concern about the existing condition of buildings. This article has emphasis that where it is the need of time to build awareness about seismic risk and building codes knowledge among public by organizing awareness programs, on the other hand it is the responsibility of the government and concern authorities to play their role in implementation of building codes in Quetta to minimize the effects of any future earthquake event.

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