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People's risk perception in earthquake prone Quetta city of Baluchistan



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ABSTRACT

Large parts of Pakistan lie within a seismically active Himalayan belt. The experts suspect that in the next century, damages from earthquakes would be unprecedented. The objective of this paper is to examine the perception of people living with earthquake risks in Quetta, using key informant interviews, community group discussions and structured household survey. The survey has been conducted among 200 households, applying the simple random sampling method. The study explored the relationship among different variables including socio-economic status of the respondents using multivariate statistics. The results revealed that earthquake risk perception associates significantly with the people's age, income, education etc. Further, the perception of earthquake risk varies among different governmental and non-governmental organizations and community members. The survey results also reveal that people know the risks posed by earthquakes but have fatalistic attitudes towards the future predictions of the earthquakes. The paper recommends programs and projects to create public awareness and preparedness for risk reduction.

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1. Introduction

Risk appears to mean different things to different people [1] and is often seen as likelihood that an individual will experience [2]. Risk perception was considered an important concept in 1960s, most notably to nuclear technology [3]. Experts and public perceive risk in different ways [4,5], however public risk perception is considered to be one of the determinants of the behavior. This would also help in designing effective protective measures [6,7]. And the contemporary risk literature concerns actions adopted by individuals to avoid risk when their

perception of risk increases [8–10]. Setbon [11] argues that there is a direct causal link between the flood safety related risk perception and actual behaviors. But to McGee (2003) risk perception does have a link with awareness and mitigation actions [12]. However literature on risk perception indicates that there is a relationship between the disaster preparedness and risk perception [13–17]. On contrary to that a number of findings indicate that the relationship between them is weak [18–20]. Development and cultural setting influences seismic risk considerably [21]. Even in some communities culture and faith can influence perception more often than experience [22,23]. These fatalistic attributes are observed in most disaster literature [14,22,24]. Contrary to that several studies indicate that cultural does not influence risk perception [25].

Risk perception does have challenges developing countries like Pakistan particularly in Baluchistan where no such studies

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Table 1
Historical earthquakes in Baluchistan.

Year	Place	Scale	Year	Place	Scale
1909	Kachh	7.2	1987	Quetta, Chaman	5.6
1935	Quetta, Mach	7.0	1990	Quetta, Kalat, Khuzdar, Mastung, Kalat, Nushki, Surab	5.8–6.1
1935	Quetta, Mastung, Kalat	7.5	1992	Khuzdar, Nal, Quetta	5.7
1941	Quetta	5	1993	Quetta/Pishin, Makran/Gawadar	5.7
1945	Pasni/Makran	8.6	1995	Quetta	5.2
1952	Loralai	5.8	1996	Quetta	5.3
1954	Khuzdar, Nal, Wadh	5.7	1997	Quetta, Mastung, Mach, Sibi, Harnai	5–6.2
1955	Quetta	6	1998	Quetta, Dalbandin	5.3
1956	Kalat, Barkhan	6	1999	Barkhan	5.2
1957	Khuzdar	5.5	2000	Quetta, Sibi, Ziarat, Harnai and Duki	6
1975	Quetta	5.4	2002	Balochistan Boarder	6
1978	Quetta, Nushki	5.3	2003	Naukundi, Musakhail	5.3
1983	Khuzdar	6.5	2004	Sibi	5.5
1986	Khuzdar	5.4	2008	Ziarat	5.4

exist [26]. Halverson et al. argue that “diminishing levels of indigenous hazard knowledge, population growth, and lack of public awareness have contributed to overall low levels of seismic cultures of in Pakistan” [27]. This has exacerbated the vulnerability of people to seismic threats [28]. Therefore this paper has attempted to analyze the attribute and perception of the people in Quetta for the first time that could play a crucial role in the development of emergency planning and mitigation [13]. In addition awareness and preparedness about hazards can really reduce the individual and community vulnerability to environmental hazards [29]. The article further explores the relationship among different socio-economic variables through multivariate statistics.

1.1. Concept, approaches of risk perception

Risk perception is seen as process of organizing and using information received through sensory observation [22]. Many scholars define risk perception as subjective judgment [30]. However risk perception is understood to be the risk that people envisage [31]. The perceived risk does not represent the probability but covers the factors such as attitude, cognition and vulnerability [14,32]. The field of risk analysis has grown rapidly, focusing on issues related to risk assessment and risk management [33]. The beginning of the risk research can be traced back during the early nuclear debate in 1960s. Based on the literature, risk perception is explained through two different approaches: the *Psychometric approach* that has roots in Psychology and the *Cultural Theory approach* developed by sociologists and anthropologists [14].

The *Psychometric approach* is the almost paradigmatic research started in 70s to up to date [34]. This includes a number of studies such as evaluation of risk communication, gender, races and demographic influences. This approach utilizes questionnaires and factor-analytic procedures to explain the primary and secondary dimensions of risk perception [35]. This approach is severely criticized by having qualitative features and mental constructs of the subjects [14]. The *Cultural Theory approach* is more sociological than psychological. Studies in the fields of sociology and anthropology have shown that perception and acceptance of risk have their roots in social and cultural factors [36]. This

approach was spelled out by Douglas and Wildavsky [32]. This approach also faced criticism for its empirical testing and informal qualitative methods [32]. The approach is also criticized for its weak methodological approach, ambiguous empirical testing and being difficult to operationalize [14].

2. Seismic hazard risks in Pakistan

Pakistan lies on the western edge of the Indian plate, bordered to the West and North by the Eurasian Plate and to the Southwest by the Arabian Plate. It is vulnerable to seismic hazards. A study of Pakistan Meteorological Department reports that, 58 earthquakes occurred in the last fifty years, which caused damages to both life and properties. The historical data on earthquakes in Baluchistan shows that it has been visited by a number of earthquakes from 1909 till to date as shown in Table 1. Since 1983, the province is frequently visited by earthquake almost every year with magnitude ranging from 5 to 7 on Richter scale [37]. The 2008 earthquake in Ziarat was destructive which has affected six districts. Some of them are notable in terms of intensity and scale of damages. So far four largest earthquakes occurred in the country such as Kangra Earthquake in 1905, Quetta Earthquake in 1935, Makran Earthquake in 1945 and Kashmir Earthquake in 2005 [39,40]. Based on collaborated study conducted by the NESPAK (National Engineering Services Pakistan) and QDA (Quetta Development Authority), the city has been divided into two seismic zones i.e. Zone A (Very High Seismic Risk) and Zone B (High Seismic Risk) presented in Fig. 1. The damages from the previous earthquakes in the city were observed more in Zone A compared to Zone B [41]. A powerful earthquake devastated Quetta city and the adjoining areas on the morning of May 31, 1935. Nearly 35,000 people were killed, most of those fatalities occurred in Quetta city alone [38].

3. Review of building codes in Pakistan

The first initiatives towards the developing earthquake resident design guidelines in Pakistan were set forth soon after the earthquake of 1931 with M. 7.4 in Baluchistan. The earthquake destroyed all the adobe structures and severely

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