

PUBLIC AND INSTITUTIONAL EARTHQUAKE DISASTER PREPAREDNESS IN DISTRICT MANSEHRA, PAKISTAN

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Abstract

The destruction caused by the earthquake can be widespread causing damage to telecommunication & power infrastructure, bridges & roads, water & sanitation facilities, and other services. Similarly, local administration during earthquake becomes mostly impaired especially after the destruction of majority of government buildings. The major earthquakes of Pakistan include Quetta Earthquake 1935, Kashmir - Khyber Pakhtunkhwa Earthquake 2005, Ziarat Earthquake 2008 and Awaran – Balochistan Earthquake 2013 which emphasized for the need of public and institutional preparedness at large scale. The objective of this paper is to assess the people and government earthquake preparedness in district Mansehra and recommend measures for its improvement. Historically, two high risks tehsils of district Mansehra (Balakot and Mansehra) were selected for this paper. A survey questionnaire was conducted using random sampling technique. The data was collected from six government departments and 498 local respondents. The results of the study reveal that government organizations have learnt lessons from the experience of past earthquake and thus increased their level of preparedness including emergency response system, early warning system, protection of assets and property, care for the human resources, addressing health issues, provision of shelter and logistics etc. Similarly, people are now well aware about the affects of earthquake disaster. The public preparedness level includes adequate knowledge about earthquake disaster, mitigation measures, alternative shelter arrangements and protection of resources. Based on the results of collected data and

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findings, the research study has proposed certain measures for further improving the public and institutional earthquake preparedness.

Keyword: Earthquake Disaster, Preparedness level, Public, Institutional.

INTRODUCTION

Encyclopaedia Britannica defines earthquake as any sudden trembling of the ground caused by the seismic activity due to mobility of tectonic plates. During this process, energy stored under the crust of earth is instantly released which produced the Seismic waves. Earthquakes frequently occur along narrow zones, geologic faults where rock masses shift in relation to one another (Bolt, 2016). Earthquakes and other natural disasters have increased manifolds due to climate change, deforestation, over population and industrialization. Earthquakes cause huge human and material loss besides leaving numerous negative psychological effects on the minds of survivors.

Pakistan and its neighbouring countries run risk of earthquake vulnerability owing to the gradual (5 cm/year) movement and bumping of the Indian Sub-Continent with Eurasian Continent (Sitharam & Kolathayar, 2013). This tectonic plate was heading with the fast speed of twenty centimetres per year prior to this collision (Kumar et al., 2007). This huge tectonic collision increased the altitude incorporating the Himalayan, the Karakoram and the Hindu Kush ranges. The junction of these three mountain ranges lies in Pakistan and is the most seismically volatile area on the face of the earth (Ismail & Khattak, 2016). The vulnerability transformed into a reality resulting into massive destruction in Kashmir and Khyber Pakhtoonkhawa in the year 2005 (Zaidi, Kamal, & Baig-Ansari, 2010). Ahmad et al. (2014) maintain that Pakistan experiences a major earthquake after every ten years. Vast areas vulnerable to earthquake in a developing country like Pakistan can cause serious budgetary constraints and hence

prudence demands carrying out a vulnerability analysis using a measure that can act as a yardstick to ascertain degree of vulnerability of different administrative areas for resource allocation prioritization. Naill M Momani (2011) developed a logical tool for the management earthquake implications. The tool links likelihood of earthquake and factors that enhance risks with the policy and judgment making processes to coin or enforce strategy, policies and operating procedures to avert or minimize the losses in terms of lives and capital. He draws an earthquake consequences model that can be used for studying areas using simple tools to measure complex realities that help predicting consequences of earthquake based on the yardstick of institutional readiness, public preparedness, structural and geological risk.

Earthquake Preparedness

During the course of history, Pakistan being located at highly seismically active region suffered several catastrophic earthquakes. The most devastating earthquake among all was in October 2005 having magnitude of 7.6 on Richter scale which badly implicated the whole nation. District Mansehra remained the most affected area in earthquake 2005 where destruction was colossal in terms of human lives and economy. It took several weeks and months to get clear information about the damage assessment after the calamity. Although few studies were conducted at that time but then it has been observed that no system of interaction or meeting are regularly conducted with the key stakeholders to discuss and revise the different action plans with a view to reduce the prevalent earthquake risk and to improve earthquake preparedness (NDMA, 2009).

Quite a few studies involving earthquake prone areas of district Mansehra and other places of the region have been conducted. Certain out of them involve appraisal of relief activities conducted sequel to the earthquake (Watt et al., 2009), proposed action plan for

various agencies involved in earthquake response (NDMA, 2009), lessons learnt from Earthquake 2005 (Javed et al., 2005), Evaluation of cash assistance program for the affectees of Earthquake – 2005 (Zaidi et al., 2010), an earthquake risk assessment study of Khyber Pakhtoonkhawa, Structural vulnerabilities of earthquake (Ahmad, Crowley, Pinho, & Ali, 2010; Quershi et al., 2014), Report by International Federation of Red Cross and Red Crescent Societies covering an appraisal of relief activities stating from assessment of needs to immediate rescue operations to rehabilitation program extending six years from the onset of Earthquake of 2005 (IFRC, 2012). Certain papers dwell upon health related consequences of earthquake such as need for blood, various types of injuries and surgeries (Sami et al., 2009; Sullivan & Hossain, 2010; Mujeeb & Jaffery, 2007) but the public and institutional earthquake preparedness still remains a weak aspect which came into the notice of this scribe. Therefore, this paper is aimed to address the public and institutional earthquake preparedness.

Earthquake Effects and Preparedness

Effects of earthquakes are trembling, earth splitting, landslides, avalanches, fires, soil liquefaction, tsunamis and human suffering. How severe are the local effects of an earthquake depend upon certain number of factors which involve geological and geographical aspects, distance from the epicentre and depth of the earthquake from the surface of the earth (Walker, 2008). Earthquake risk involves expected losses due to an earthquake occurring in a given area over a specific period of time. The level of risk depends on magnitude of the earthquake, susceptibility of the affected elements and economic value of those elements. Earthquake preparedness is taking measures and certain actions to lessen or limit the adverse impacts of an earthquake. Although the adverse impacts of an earthquake cannot be prevented fully but its severity can be minimized by various strategies and actions. In order to prepare for any disaster, it is imperative to carry out risk analysis

(Walker, 2008).

Study Area and Methodology

District Mansehra is located in the centre of Khyber Pakhtoonkhawa. It has an area of 4579 Square Kilometres. It is bounded by Diamir and Kohistan districts in the north, district Abbottabad in the south, Muzaffarabad district in the east and district Swat in the west. The Karakoram Highway passes through Mansehra district which comprises of tehsil Mansehra, tehsil Balakot, tehsil Oghi and Kala Dhaka (Provincially Administered Tribal Area). Tehsil wise population of district Mansehra is given in Table 1 below;

Table 1: Population of the District

Tehsil	Population	Percentage
Mansehra	394766	51.25
Balakot	152319	19.77
Oghi	139223	18.07
Kala Dhaka	83927	10.89
Total[§]	770235	



[§] Population Census 1998 - Statistical Division GoP <http://www.pbscensus.gov.pk/sites/default/files/Files/KPK.pdf>

The study is exploratory in nature and has two parts. The first part was to collect data from state institutions that directly participated in earthquake disasters. The data was collected from top management of the six organizations for assessing their preparedness level and lessons learned from the past experience of earthquakes. The second part of the research was to collect data from the local respondents of two tehsils of district Mansehra (tehsil Mansehra & tehsil Balakot) using random sampling technique. The questionnaire was adopted from Momani (2011) for both i.e institutional preparedness and public preparedness. Five organizations and 498 respondents from both tehsils were participated for this research.

RESULTS AND DISCUSSIONS

Table 2: Demography of Respondents

Predictors		Frequency	Precent
Area	Balakot	199	40.0
	Mansehra	299	60.0
	Total	498	100.0
Gender	Male	336	67.5
	Female	162.	32.5
	Total	498	100.0
Age	20 to 30 yrs	205	41.2
	31 to 40 yrs	179	35.9
	41 to 50 yrs	50	10.0
	51 to 60 yrs	60	12.0
	61 and above	4	0.8
	Total	498	100.0

Qualification	Matric	293	58.8
	Intermediate	109	21.9
	Graduation	79	15.9
	Master	17	3.4
	Total	498	100.0
Occupation	Un-employed	107	21.5
	Pvt. Job-holders	264	53.0
	Govt. Job-holders	102	20.5
	Business Owners	21	4.2
	Other	4	0.8
	Total	498	100.0

Table 3: Public Past Experience Towards Earthquake

Statement	Yes		No	
	f	%	f	%
1. Have experienced earthquake in the past	315	63.6	183	36.7
2. Any Lessons learned from the experience of past earthquake?	384	77.1	114	22.9
3. Availability and practicing any family response plan?	142	28.5	356	71.5

Table 4: Public Preparedness Level

Statement	Yes		No	
	f	%	f	%
1. Willingness for adoption of any known earthquake mitigation measures?	492	98.8	6	1.2
2. Knowledge about government earthquake policy for protection of	292	58.6	206	41.4

people and assets like building codes, emergency response plan, civil defense plan etc.?				
3. Having any alternate place in case of destruction of house due to earthquake?	218	43.8	280	56.2
4. Any response plan for taking certain precautionary actions and measures in case of an earthquake disaster?	343	68.9	155	31.1
5. Possession of earthquake emergency kit in the home to include items like emergency food, ration, torch, water, first aid kit, radio, basic tools etc?	417	83.7	81	16.3
6. Making any efforts to save house hold items like computers, shelves, televisions etc in case of an earthquake?	455	91.4	43	8.6
7. Awareness about certain actions which are to be taken in case of any earthquake?	380	76.3	118	23.7
8. Any urge for obtaining knowledge about the certain actions which are to be taken during an earthquake?	392	78.7	106	21.3
9. Desire to join workshops, seminars or any other classes to acquire more knowledge about earthquakes?	418	83.9	80	16.1
10. Willingness to assist trapped people during an earthquake through conducting search and rescue operations?	463	93.0	35	7.0

As mentioned earlier, the data was collected from the two most affected tehsils of district Mansehra (tehsil Balakot & tehsil Mansehra) in Earthquake 2005. The respondents for data collection from tehsil Balakot and tehsil Mansehra were 199 and 299 respectively. The socio - economic characteristics and previous earthquake experience are mentioned in the table. The data was collected from both types of respondents (affected / not affected from the past earthquakes). It has been widely observed that majority of the people has learned the lessons from the past earthquake and have taken adequate mitigation measures to avert future losses. They are now well informed and possess disaster supply kits in their homes, arranged alternate shelters and taken certain precautions for their property, animals & other assets. They have acquired the basic knowledge and know what to do and how to do it in case of an earthquake. The respondents are also interested to join classes and workshops to learn more about the earthquakes and other impending disasters. They are also interested in learning and adopting new techniques and methods to cater for any potential earthquake.

The above respondent's response is based on existing/previous experiences and declares that they have attained certain level of preparedness in dealing with earthquake disaster situations.

INSTITUTIONAL PREPAREDNESS

Table 5: Demography of Official Respondents

Predictors		Frequency	Percent
Gender	Male	15	75
	Female	5	25
	Total	20	100
	NDMA	4	20.0

Org	PDMA	4	20.0
	DDMA	3	15.0
	NESPAK	5	25.0
	C&W	2	10.0
	ERRA	2	10.0
	Total	20	100
Age	20 to 30 yrs	12	60.0
	31 to 40 yrs	3	15.0
	41 to 50 yrs	2	10.0
	51 to 60 yrs	3	15.0
	Total	20	100

Statement	Yes		No	
	f	%	f	%
1. Any previous experience of your organization in handling emergencies or participation in any disaster?	17	85.0	3	15.0
2. Learning any lessons from the previous experience of earthquakes?	18	90.0	2	10.0
3. Any pervious earthquake experience by your organization?	13	65.0	7	35.0
4. Implementation of past mitigation measures to avert losses of any future earthquake?	14	70.0	6	30.0

5. Does your organization exercise earthquake mitigation measures in true letter and	13	65.0	7	35.0
6. Any system of passing timely information or reminding people about earthquake hazards?	18	90.0	2	10.0
7. How often your organization practice / rehearse such emergencies in one year?				
1-5 times			15	75.0
More than 5 times			5	25.0
8. Any recently tackled disaster or emergency by your organization?				
With in one year			11	55.0
More than one year			9	45.0
9. Last response of your organization in handling an earthquake?				
Less than 15 years			14	70.0
More than 15 years			6	30.0
10. Involvement of your organization last time in earthquake emergencies?				
More than 5 year			10	50.0
Less than 5 year			10	50.0

Table 7: Government Institutional Preparedness Level

Statement	Yes		No	
	f	%	f	%
1. Implementation of my property protection measures to alter the design and constructions to decrease earthquake hazards?	17	85.0	3	15.0

2. Adherence of any natural resources protection measures to reduce the earthquake losses e.g. erosion and sediment controletc?	16	80.0	4	20.0
3. Implementation of any crisis service safety measures like early warning system before and after the earthquake?	15	75.0	5	25.0
4. Periodic revision of any safety measures in view of previous experience of earthquake by your organization?	16	80.0	4	20.0
5. Adherence of any structural measures by your organization to protect general public and their assets from a known risk of earthquake?	19	95.0	1	50.0
6. Does your organization has any emergency operations plan against an earthquake?	18	90.0	2	10.0
7. Availability of a plan with assigned tasking to the departments and individuals during any crisis?	18	90.0	2	10.0
8. Availability of a plan with assigned responsibility to the command authority and managerial association and system to coordinate various actions during an earthquake?	17	85.0	3	15.0
9. Any check list in the organizational plan for availability of dedicated manpower, food and ration, medicine, basic facilities in all the stages of an earthquake?	18	90.0	2	10.0
10. Any early warning system to inform people before, during and after an earthquake?	19	95.0	1	5.0

11. Any procedure to communicate people and provide them necessary guidelines during an earthquake?	17	85.0	3	15.0
12. Any procedure for provision of shelter and food to the affected people?	17	85.0	3	15.0
13. Measures to address medical care and health issues after an earthquake?	19	95.0	1	5.0
14. Plan and procedures for evacuation of injured or disabled persons through prescribed routes and nominated transport?	19	95.0	1	5.0
15. Identification and availability of supplies and resources during an earthquake disaster?	19	95.0	1	5.0
16. Any defined and designated facilities for emergency use?	16	80.0	4	20.0
17. Any designated shelters marked by your organization to accommodate earthquake victims and first responders?	15	75.0	5	25.0
18. Are shelter location and transportation routes known to the people?	17	85.0	3	15.0
19. Have certain facilities like delivery centers made available to the public for emergency and food supplies?	17	85.0	3	15.0
20. Procedure for conducting rapid impact assessment after an earthquake?	17	85.0	3	15.0
21. Availability of trained teams within the organization to carry out earthquake survey assessment?	16	80.0	4	20.0
22. Adherence of any mitigation measures against the potential earthquake losses?	18	90.0	2	10.0

23. Implementation of community health measures to cater for hazards and risks of an earthquake?	17	85.0	3	15.0
24. Procedure for reconstruction of bridges, roads, public works after an earthquake?	16	80.0	4	20.0

The institutional data was collected from major government organizations which always have a leading role in managing disasters including earthquakes. Six departments were selected for collecting the data which include National Disaster Management Authority (NDMA), Provincial Disaster Management Authority (PDMA), District Disaster Management Authority (DDMA), National Engineering Services Pakistan (NESPAK), Earthquake Reconstruction and Rehabilitation Authority (ERRA) and Communication & Works Department (C&W). The key purpose was to assess their earthquake preparedness level based on their previous earthquakes experience and propose certain measures to reduce the impact of future earthquakes. 15 males and 5 females were selected from the organization for collecting the data and their age description is mentioned in the above table. The participants selected for this purpose were appointed on responsible posts and had complete information about the plans and policies of their respective departments. The above stated table indicates that majority of the organizations have sufficient knowledge about earthquakes. These institutions have learned valuable lessons from the past experiences and have dealt emergencies for more than one time. Moreover, these organizations actively participated in Earthquake - 2005 for rehabilitation and reconstruction activities. It has been revealed through the collected data that important aspects being addressed by the concerned organizations are: management of human resource, protection of assets and natural resources, implementation of warning system, shifting of people and assets to the safe places, addressing and remodeling health issues for catering the health challenges. The

above mentioned table illustrated that organizations have upgraded their procedural systems and trained their employees accordingly to minimize the impact of future earthquakes. More than 80% organizations have adopted viable procedures for the protection of human resource and property, implementation of early warning system, availability of emergency services, shelters for alternative living and reconstruction of damaged infrastructure. The institutions are equipped with well-trained teams ready to move from one place to another in earthquake affected areas to help the affected people. Similarly organizations are also concentrating upon the health issues, proper communication system and structural aspects thus preparing to meet the earthquake challenges in future.

CONCLUSION:

The research findings help conclude that government institutions and general public of both the tehsils of district Mansehra have learnt lessons from the past experience of major earthquake 2005. These tehsils have enhanced their level of preparedness for better handling of such natural calamity in future. Government Institutions focused more on emergency response, natural and human resources protection, early warning system, reconstruction and rehabilitations, provision of shelters, forming specialized teams to operate in earthquake affected areas, etc. Hence, the existing earthquake preparedness level of Govt Institutions can be graded much better as compared to the previous level. Similarly, people's preparedness level has also been increased and it has been revealed that they are keen to learn more about earthquakes. However, people and institutional earthquake preparedness can be further improved by taking certain measures at government level. Few in this regard may include: signing MoUs with foreign disaster managing agencies of the developed countries like Japan, China, Australia, enhancing capacity building of lead agencies like NDMA, PDMA, DDMA and ERRA, judicious resource

allocation, procurement of modern equipment and machinery, better liaison and coordination with NGOs / INGOs, health departments and law enforcement agencies, better contingency planning, preparation of response and recovery check list, well-rehearsed joint mock exercises etc. Earthquakes, although, cannot be averted or prevented but their impacts can be minimized by ensuring effective mitigation measures and improving preparedness level.

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