

EMERGENCY SETTLEMENT EXPERIENCES IN IRAN: LESSONS TOWARD MORE EFFICIENCY IN POST-QUAKE

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Keywords: Emergency Response, Post-Quake, Iran

ABSTRACT

This paper is based on a study about emergency settlement challenges in devastating earthquakes in Iran during last 20 years. Considering the length of reconstruction programs in Iran and the importance of population settlement in post event, planning for emergency settlement is a priority in risk management. Usually disaster-affected population prefers to stay next to their demolished houses; therefore, decisions and policies in emergency phase could affect further phases in post event. The goal of the study is proposing some guidelines to improve the emergency settlement process in the country. In this paper first, an overview of components and details of emergency settlement phase such as rescue, relief, emergency shelter, community participation, are studied. Then emergency settlement experiences in devastating earthquakes during last twenty years including Manjil earthquake (1990), Avaj earthquake (2002), Bam earthquake (2003), Silakhor earthquake (2006) and Varzaghan earthquake (2012) are studied. Based on emergency settlement experiences in Iran conclusions are made and guidelines and proposals are presented.

INTRODUCTION

Emergency settlement phase includes the time for response (0–10 days) and relief (0–25 days). During this time the goal is to stabilize the situation—through rescue, immediate medical aid, provision of food and emergency shelters, care for the dead, identification of dangerous structures and control of situations. In these early days it is critical to ensure that the affected population has access to food and basic health services. In parallel of stabilizing the situation the planning for recovery start (GFDRR, 2011).

The immediate post-disaster period is obviously one with immense potential for confusion, or at least for many of those involved to take actions that serve opposite or divergent purposes. Decisions must be made quickly, with little time for reconsideration before new problems urgently demand resolution (APA, 1998).

Rapid rescue of people from collapsed buildings after the impact of a destructive earthquake can save considerable numbers of lives. The principal factors determining the number of people killed and seriously injured after a building collapses are the proportion of people who are unable to escape from the collapse (those trapped by collapse), their injuries and the length of time they are able to survive with those injuries, and how quickly they are able to be rescued and receive medical attention (Coburn et al., 2002).

Immediate medical attention to victims is essential. Some medical treatment can be provided as soon as buried victims are accessible. Victims may require rehydration, drug treatment and intravenous transfusions *in situ*. In severe cases, amputations may need to be performed. One of the most critical medical complications for trapped victims is *crush syndrome*. One of the greatest needs that rescue and medical treatment teams have is for ways of transporting injured victims to hospital or treatment centers. This need is immediate, and greatest in the first few hours after the earthquake. With good medical care, seriously injured victims can be stabilized at the rescue site, but without early hospitalization and surgical medical treatment in a suitably equipped operating theatre, their chances of survival are remote (Coburn et al., 2002).

There is an urgent need for shelter for the population made homeless by building damage; there will be needs for food, drinking water, clothing, sanitation and basic comfort provision (OCHA, 2008). Tents are the most useful form of immediate shelter for very large numbers of homeless people. Tents are relatively easily stockpiled and transported, rapidly erected and can provide adequate climatic protection against quite extreme conditions. They are also safe against aftershocks or another strong earthquake. Tents are difficult to erect in hard urban landscapes, or on steep gradients or in strong winds, but in most other situations can be pitched close to the damaged house (important to householders wanting to protect possessions or tend the gardens) or on adjacent public open space. Undamaged buildings, particularly public buildings like schools, town halls or other undamaged community buildings could be used as emergency shelters. Field camps should be avoided, unless they can be sited safely near the homes of those affected (Coburn et al., 2002).

IRAN'S EXPERIENCES ON EMERGENCY SETTLEMENT

MANJIL EARTHQUAKE

Manjil Earthquake occurred on June 21, 1990 at 0:30 a.m. in Gilan and Zanjan Provinces. This earthquake caused more than 15000 human loses and more than 30000 injuries. As a result, more than 500000 people became homeless, three cities (Rudbar, Manjil and Loushan) and about 700 villages destroyed and other 300 villages damaged heavily. There was no preparedness among authorities and residents and consequently the golden time in post event somehow gets lost that led to losing lives and resources. Although residents started rescue and relief after the event, but due to unfamiliarity with proper rescuing methods in some cases the rescued people passed away.

Tents were distributed as emergency shelter but the numbers of distributed tents among residents were not adequate and consequently people had to live in unsuitable situation. Due to damaged areas spreading, emergency settlement camps couldn't be set up in whole areas. In areas that such camps were settled the residents were reluctant to move into them. Emergency settlement phase in this event was rather long and living in tent caused many problems for residents as cold season started. Warming the tents was a major issue. In some affected areas the residents were settled at schools but in some other areas the schools were damaged and could not be used as shelter. Those people who were settled at schools had to leave them after few months due to reopening of schools.

The rescue and relief staffs had come from different parts of the country and therefore had no familiarity with the affected areas. After a while that the rescue staffs got some familiarity with the areas culture, their duty was over and had to leave the affected areas. As a conclusion these staffs had not much success in attracting community participation (Pourahmad et al., 1991). Consequently the relief organizations did not consider local people to participate in post event activities. On the Other hand there were many volunteers in affected areas that were eager to contribute but the relief organizations didn't consider them. Therefore the volunteers and residents had no participation and just watched the undertaken affairs. In rural areas people were more active and did rescue and relief, death bodies' burial, food distribution etc. by themselves. These activities were very important as in some areas the rescue and relief teams could not enter the areas due inaccessibility. In cities affected people could participate in different tasks such women could prepare meals and this could reduce the expenses and their mental pressures, while other organizations served meal for people. In some rural areas the residents formed some security groups to prevent loot that were very effective.

In emergency response period some relief organizations gathered the elderly in special camps called "elderly center" that caused many mental problems for these people and consequently had to return people to their own places.

CHANGOUREH-AVAJ EARTHQUAKE

Changoureh-Avaj Earthquake occurred on June 22, 2002 at 7:28 a.m. in eastern part of Qazvin Province in northwestern part of Iran. 261 people were killed and 1300 got injured and many residential units were destroyed. The earthquake domain included four provinces (Qazvin, Hamadan, Zanjan and Markazi) and the shakes were felt in Tehran too. The human losses and damages in this event were rather low and this was because of following reasons:



- Earthquake occurrence time: at that time many people had left their homes to work so they were alert. Also this occurrence time gave enough time to rescue and relief groups to conduct the emergency relief operations.
- Building types: most building were one or two story buildings so many people stayed alive under debris.
- Self-rescue and relief: due to buildings type and materials, there was no need to use special machinery and instruments to evacuate. This increased the chance of saving lives.

While residents started rescue and relied actively, but due to lack of familiarity with proper methods some injured people hurt and in some cases they passed away (Iranian Red Crescent, 2002).

Tents were distributed among residents (Fig. 1) and some schools' buildings were used as emergency shelters. Living in tents for long time especially in cold weather caused many physical and mental problems for people. Warming inside tents caused some dangers such as fire breaking.

Due to lack of preparedness there were some problems in emergency phase such as difficulties in affording drinking water, bathrooms etc. There weren't many volunteers in the affected areas and the emergency relief mainly completed by residents, military forces and relief teams. Among these groups the residents played effective roles in rescue and relief and securing the immediate needs (BHRC, 2002).



Figure 1. Emergency shelter in Avaj earthquake

BAM EARTHQUAKE

On December 26, 2003 at 05:56 (local time), a devastating earthquake of $M_w=6.5$ occurred in South-West of Bam City in southern parts of Iran. This earthquake caused catastrophic damage to the Bam city and neighboring villages with a collective population of about 142,000. More than 26,000 people were killed, 30,000 people injured, about 75,000 left homeless, and 85% of the housing and infrastructure were destroyed.

After this event the affected people tried to rescue their own family members and neighbors, but because of unfamiliarity with proper rescue methods in some cases hurt injured people. Some foreign rescue and relief teams entered the city. These groups arrived rather late and could only be helpful in finding corpses. Some of these groups carried out some complicated engineering facilities that were unusable in the city. Due to the mentioned matters many rescue teams were inactive and after a short period of time left the city. In general the local residents and military forces were effective in rescue and relief (Towfighi, 2004).

Tents were used as the main emergency shelter and some camps were established. Residents mainly stayed near their destroyed houses (Fig. 2). Some people also took some necessary stuff and went to other

cities live with their relatives. Some rural residents moved into the city to receive tent and other things (Red Crescent, 2004).



Figure 2. Tents erected near destroyed houses in Bam city

The distribution of goods and services didn't accomplish in a proper way and consequently the feeling of discrimination was created among them. Such feeling made them disinterested to participate. Although local residents rescued their family members and neighbors actively, but after a short period of time residents were not interested to participate. Many volunteers that had come to the affected areas left the areas after a while. There are some reasons in this regard:

- Authorities did not consider community participation and they did not assign any specific task to residents. In fact, authorities did not believe that community participation could improve the emergency situation.
- Some people were not interested to participate due to the mental pressures. Authorities did not pay much attention in such matter.
- The way that rescue and relief teams treated people, led people to consider themselves as receivers that is a passive manner. Some rescue teams disappointed people and consequently they lost any interest in participation.
- The distribution of goods and services did not accomplish in a proper way and consequently a feeling of discrimination was created among residents. Such feeling made them disinterested to participate.

LORESTAN EARTHQUAKE

On March 31, 2006 at 4:47am (local time) an earthquake of $M_w=6.1$ occurred in southern part of Boroujerd City in south western part of Iran. This earthquake caused 63 deaths, 1418 injured and 15,000 homeless. A total of 330 villages were damaged, roughly between 30 to 100 percent, with 70 villages completely destroyed.

The number of deaths and affected people is not as high compared with similar earthquakes that happened in the country. This is because most residents in the province were alarmed by a weaker earthquake a few hours before the main one. Therefore most people spent the night outdoors. The provincial governor's office dispatched messengers to villages to warn residents not to spend the night inside their houses. This lesson was learned from Bam earthquake in 2003 that killed 30,000 people as they were asleep.

Tents were used as emergency shelter in this event. Due to lack of any proper planning in tents distribution, there were problems such as lack of proper prioritizing in tents distribution in terms of affected areas' needs and thereupon in many damaged villages there was no tent as shelter but in cities people received tents and pitched them in streets and parks (Fig. 3). Due to shortage of tents in some villages people settled in their own destroyed buildings to protect their properties and livestock and such situation was dangerous because of aftershocks. The distributed tents had different shape, material and expansion. Some of them were resistant to rain and humidity, while the classic types had rather low quality and due to differences between distributed tents a feeling of discrimination was created among people. Some households didn't know how to pitch tent properly so after few days some of these tents lost their functionality because of rain or wind. The Red Crescent tried to pitch tents by its own staffs that took some long time. Insufficient bathrooms and showers were other problems. Shortage of drinking water was another problem. Although it was supposed that the Red Crescent distributes the bottles of drinking water among people, but in some villages nothing was done until three days (Housing Foundation, 2006).



Figure 3. Tents pitched in streets and public places in Lorestan earthquake

People participated actively in emergency response operations. Most trapped people under debris were rescued by residents of damaged areas. Although residents were unfamiliar with proper search and rescue methods that caused some problems, but in general they played effective roles in rescue operations.

VARZAGHAN EARTHQUAKE

On August 11, 2012 two earthquakes of $M_w = 6.2$ and $M_w = 6$ occurred in East Azerbaijan Province in north western parts of Iran. Cities of Varzaghan, Ahar and Heris have had most damages and more than 300 people were killed and more than 2000 people were injured. The earthquake was felt among five provinces in north and north-western parts of Iran (IIEES, 2012).

Rescue and relief did not start immediately by national rescues and relief teams due to telecommunications cut off and it took few hours until communications resumed and rescue teams were dispatched to affected areas (The Government Office of East Azerbaijan Province, 2012).

Hospitals were unusable due to damages and also aftershocks prevented hospitalization of patients and also, there was no safe place to perform relief and medical operations. In Ahar city there was no morgue to keep corpses and consequently corpses were transferred to the hospital and due to lack of capacity some problems emerged. Many Hysterical patients were rushed to the hospital and expected to receive quick

treatment while injured people need immediate attention and treatment (Disaster Management Council of Ahar city, 2013).

Red Crescent entered affected areas rather early and started distributing tents (Fig. 4) and basic needs of affected people and also due to some impassable roads they had to use helicopters. Rescue and relief activities in remote villages were done with more delay and difficulties. To affected people distributed tents were not suitable in warm and cold weather and living in tents had environmental, health and social consequences. Many tents occupied by multi-families and obviously such situation increased tensions and culturally was inappropriate. In some villages due to lack of baths residents have to take bath in rivers and such situation caused children to get sick. Considering this situation and living condition in tents that were not suitable in cold weather of affected areas, and existing of corpses under debris intensified the situation. People who had infected disease or mental disorders could not obtain medicines and as a result their situation worsened (Naghesh Click Social Study Group, 2012)



Figure 4. Distributed tents by Red Crescent in Varzaghan earthquake

Some problems were experienced in this event: (Disaster Management Council of Ahar city, 2013)

- Telecommunications were cut off due to earthquake.
- Lack of radio network centralized among disaster management task forces.
- Lack of suitable packages by Red Crescent such as setting up bathrooms and showers.
- Lack of adequate financial sources for unexpected situations.

CONCLUSIONS

Although time interval between the studied earthquakes is rather long and these earthquakes struck different parts of Iran, but there are similarities in emergency response and operations such as residents' role in rescue and relief, accessibility to affected areas, difficulties of emergency shelters and lack of community participation. These matters mainly originate from not considering post-quake phases and activities in a proper and planned manner and thereupon disorganizations and disorders appear in emergency response. Based on five devastating earthquakes in Iran the following guidelines are proposed:

- Damage reduction measures in pre-event such as structural strengthen, optimizing transportation network or community earthquake preparedness etc. affects immediate post-event situation and emergency response. If structures damage less thereupon human loss will be less and disorders will

- be reduced in post-event. To improve emergency response, it is necessary to develop damage reduction plans considering post-event situation to achieve sustainable risk reduction.
- Time is very important during emergency phase since most lives and properties could be saved in immediate post-event. This indicates that local sources (human/material) are more helpful and usable than outside rescue teams and materials. Affected people and volunteers from inside stricken areas could help in many activities such as rescue and relief and in other activities in further phases of post-event. Therefore it is important to use local human and material sources that culturally and economically are more effective and acceptable.
 - Emergency response plans need to be developed at regional and local level to be in accordance with real situation and to save time too. National plans require coordination at national level too and in critical situation in post-event such process takes more time and sometimes creates complications. Besides national level decisions might not be in conformity with real situation in affected areas. Developing emergency plans at regional and local level specifies capacities and weaknesses and could improve emergency response.
 - Although tents are the most common type of emergency shelter, but they are not suitable to be used in long time. Durability and resistance of tent in hard climatic situation, makes it suitable for short period of time. In cities it is better to consider centers as emergency shelters to be settled in times of disasters. Such centers need to be identified and equipped at urban areas and their capacity should be specified.
 - During emergency phase the stricken community is shocked and may not react explicitly to decisions and actions taken by authorities. Decisions and actions comprising drastic changes such as population relocation or land clearing should be avoided. Such matters might be in contrast with residents' wish and thereupon causes residents' reluctance and indifference. Also drastic actions could lead to some fundamental changes like permanent migration of population or unbalances between areas and residents.

REFERENCES

- Building and Housing Research Center (2002) The primary report of Changoure-Avaj Earthquake, Tehran, Iran
- Coburn A and Spence R (2002) Earthquake Protection, John Wiley & Sons, LTD
- Global Facility for Disaster Reduction and Recovery (2011) Earthquake Reconstruction
- Housing Foundation (2006) A Brief Report on Bam and Lorestan Reconstruction Rural Housing Rebuilding Plan, Office of Reconstruction and Rural Housing, Tehran, Iran
- International Institute of Earthquake engineering and Seismology (2012) Initial Reconnaissance Report of Varzaghan earthquake, Tehran, Iran
- Naghesh Click International Company of Information Processing (2012) An Investigation on Earthquake Affected Villages in East Azerbaijan Province
- OCHA, Shelter Center, DFID (2008) Transitional settlement and reconstruction after natural disasters
- Pourahmad Jaktaji MT, Khadivifard S and Ghorbanzade A (1991) Gilan Earthquake Narrated by Press, General Office of Culture and Islamic Guidance, Rasht, Iran
- Red Crescent of Iran (2002) A Brief Report on Qazvin earthquake, Rescue and Relief Organization on Iranian Society of Red Crescent, Tehran, Iran
- Rescue and Relief Organization (2004) Final Report of the Red Crescent Society's Performance in Bam Earthquake, Tehran, Iran
- Schwab j, Topping CK, Eadie Ch, Deyle R, and Smith R (1998) Planning for Post-Disaster Recovery and Reconstruction, FEMA, APA and PAS



The Government Office of East Azerbaijan Province (2012) A Documentary Report of Arasbaran earthquake, Tabriz, Iran

The Government Office of Ahar city (2013) The Annual Performance Report of Disaster Management Council, Ahar, Iran

Towfighi Namin F (2004) Rescue and Relief Process in Disaster Management with a Report of Bam Earthquake, The Scientific Conference on Bam Earthquake Experiences, Management and Planning Organization, Tehran

