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Original Article

Identifying the Urban Vulnerable Areas Against the Earthquake with Giscase Study-Radio Darya St. Chalous

Maryam Ilanlu[1], Ali Ardakani[2], Hassan Paknezhad[*3], Milad Ebrahimi Gelsefid[4], Yahya Aziz Soltani[4]

[1]Assistant Professor of mahshahr Islamic Azad University, Department of Geography, mahshahr, Iran
[2]Assistant Professor of imam Hussein University, Department of Geography, Tehran, Iran
[3]Young Researchers and Elite Club, Chalus Branch, Islamic Azad University, Chalus, Iran
[4]M.A Candidate in Geography & Urban Planning Of Islamic Azad University

*Corresponding Author E-mail: paknezhad209@yahoo.com

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ABSTRACT

Earthquake is one of the factors that considered less than other disasters. However, according to critical conditions of our country and Potential vulnerability to earthquake, it must be taken into account as one of the most basic natural destructive elements. Most of the researches on earthquake deal with issues, such as the increased resistance of the instruction by using durable and high quality of materials. Of course while confirming this principle it is important to note that what areas are most and least vulnerable in the present situation? Indeed, earthquake as a natural phenomenon does not cause undesirable results itself. What makes this phenomenon a disaster is the lack of prevention and readiness to deal with its consequences? The aim of present investigation is to evaluate the vulnerability, its rate and also ways of reducing vulnerability in Chalous city. To commence study and Identification of restricted vulnerable areas, real data from Property audits plan was used. And also the data base was made for recognizing how much of buildings are Vulnerable against earthquake and also we investigate the vulnerability. The current study seeks to show a relationship between factors such as Area Components, Building lifetime, kinds of materials, the quality of instructions, number of floors, Proximity the fault and vulnerability in development area.

Keywords: Vulnerability, Urban Buildings, Earthquake, GIs.

Introduction

Environmental hazards are the most important relationship between human and natural environment. Environmental hazards may be the human or natural and also its result refers to the human and Environment. Threat to human health includes excessive population, crimes, war, downturn, disease, and natural hazards include flood, volcano, draught, deluge, and earthquake. Sometimes the source of

the risk is shared between humans and the environment. Hazards, whether natural or man may be occurs in a process of regular time (sequentially) or irregular (broken). It is easy to deal with regular threats, but the key is how to deal with irregular threats, it can be controlled or eliminated or how we can primarily adjustment the irregular risks with our purposeful planning. Another problem is the space where the risk occurs. It is clear that each risk can be happen at any level from local to national. Even the global aspects should also be considered (Moghimi & et al, 1382: 3). In addition to the increase in natural disasters over the past decade, increasing victims is due to the high vulnerability of urban communities. Today, there are about 480 cities in the world with a population of over a million people. Unfortunately, Due to lack of proper planning, many of these cities are faced with space constraints and it makes compressed the urban texture and increased the density of urban population. At the most of the time the poor urban areas (e.g. Fault zones) are used by poor people (Habibi & et al, 1389: 21). Over the past century, more than a thousand devastating earthquake occurred in seventy countries around the world and killed millions of innocent lives and has caused enormous material damage. However, Earthquake death toll was high in urban areas, and eighty percent of the casualties of the earthquake in China, Iran, Peru, Guatemala and Turkey respectively. The rapid growth of cities in the world makes this crisis more and painful (Ahad nezhad, 1389: 2). Over the past five decades, several earthquakes have occurred in our country; almost all of them have led to terrible disasters happenings. Buin-Zahra earthquake (1960), Tabas (1980), Roudbar and Manjil (1990), Baam (2003) and Zarand in year (2003), Ahar and Varzeqan, Birjand and Saravan, Bushehr, Haji Abad and Kakiin year (2012) are the indicate of this sad reality. We have not set an example of past accidents and tragedies occur regularly, while other countries (us, japan) which are at risks of permanent earthquake have achieved great success in this case. Baam earthquake was one of the most catastrophic earthquake in Iran's history or even the world in Percentage of casualties (Dorudi, 1389: 3). The high number of casualties in this incident is related to the time and place of an earthquake, but the main cause of mortality in some cases can be summarized as follows:

Lack of awareness of city vulnerable points

Inefficient and none resistant construction

Dysfunctional of crisis management And aid after an earthquake and loss principled organization in this case (Zangiabadi, 1385: 115-130).

With urban expansion and economic growth will gradually need to reduce risk, not only to ensure the control of risks, but also of other important measures, and management, production planning and tracking projects by inhibiting the expression of vulnerability, increased (liangfu,2007 :371-2). Studies show that 67 percent of our country is in the moderate and top range of seismicity. Natural disasters are not evil in itself or disaster, but Human ineffectiveness in dealing with them, causes of disasters or crisis. Earthquake both psychologically and financially due to the speed and volume of degradation is associated with adverse outcomes and is located at the beginning of the natural disasters. When Issues arising from the ground shaking is very acute that:

The degree of tremors Richter scale is high.

Vibration duration is long.

Biological complexes are close to the epicenter of the earthquake.

Structures are not of sufficient strength.

Structures are not the sufficient strength.

More Population and facilities were based on Biological complex.

Unsuitable and no quality of Biological complex integrated platform.

When an earthquake occurs Unexpected (At night)(Zangiabadi, 1385: 115-130).

The data that used in this paper are taken from the Chalus Municipality and the method based on IO model in GIS. For this purpose, the areas considered the streets that called Rado Darya Street in north of chalus and the study area is 2272516 meters (2/227 acres) and includes two city districts. Over the past years the town has affected by the Alborz faults which was not severe. This issue shows the necessity of vulnerable city areas recognizing to provide especial program for prediction and preparation during the natural hazards especially earthquake. Existence of central Police command, Judicial Department of the armed forces, oil depots and gas stations, sporting halls, radio building and several schools are the Expression of national importance of this area. Damages of this area in possible events could be deeply consequences for urban management even in state and impose the many social and economic losses to the citizens and authorities. The combination of these factors has been the causes of choosing this district as the study area. In the past decades, and with the importance of preparedness against environmental hazards, a lot of models have been used to evaluate and reduce earthquake vulnerability. Mr. Antonioni and coworkers have been studied and proposed algorithm in an article entitled earthquake effects on industrial installations by using the data from previous earthquakes (Antonioni, Spandoni & Cozzani, 2007). Mr. Cava, in 1999, to prepare a vulnerability map has used the GIS. He used some information such as topography, faults zone, location of critical infrastructure such as power stations, roads and eventually the population distribution is used for his vulnerability modeling (Cova, 1999:845-855). Mr. Rashid in year 2003, using GIS for modeling of earthquake vulnerability. Fuzzy logic has used in his article and he developed a model for predicting the risk. He uses the factors in the model as the criterion such as Performance of bridges, Emergency medical services, Hospitals, power transmission lines, Main Pathways, The maximum cost of reconstruction of buildings, The need for shelter, The volume of the rubble and the percentage of regions vanished by fire (rashed&weeks,2003 :547-576). Mr.Paknezhad in a research as the modeling of urban buildings in earthquake vulnerability in the GIS, tried to assess the role of the vulnerability of their buildings in the city (paknezhad, 2013). Ms. karimpur on her MS Thesis, had a assess for Old texture of sari city in GIS with IO model and then Vulnerability map of the area provided (karimpur, 2012). Dr Kumar's Habibi and colleagues in 1389 have been prepared an article entitled Urban Earthquake Vulnerability Evaluation by using AHP & GIS-A Case Study of District 6 of Tehran municipality (Dr. Habibi & Associates, 1389). Land use, quality of the buildings, number of floors, construction materials, and building lifetime, Fragment size, are some vulnerability assessment factors. So study

these factors and recognizing vulnerable city areas are the goals of this paper to reduce the vulnerability of earthquake in case study district.

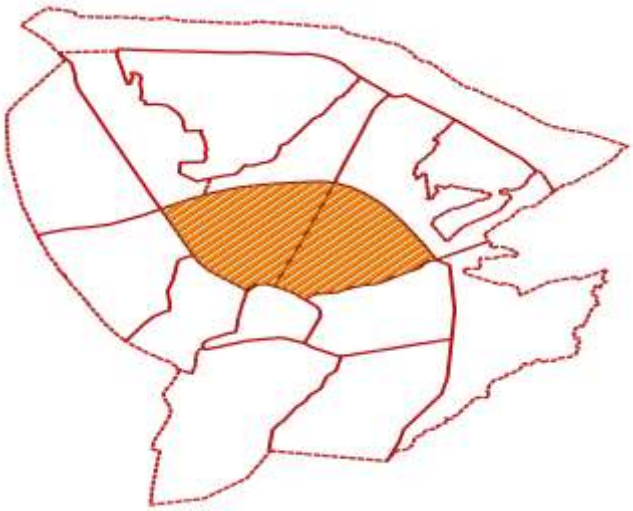

Figure 1. The area position within the Chalous town

Calculating of the vulnerability

Vulnerability assessment of buildings in cities generally depends on Researcher Comments and interests. Io (index overlay) is an intuitive model for all academic levels and all. It is also an incentive for those who have an interest in this issue to seek other models may be used for this field.

First step: the parameters

• The quality of Construction: This is a very important indicator of the impact of the vulnerability on a building. Sustainability of new buildings is at a higher level than the restoration or old buildings.

• Building Material: this factor is for understanding which type of materials had been used in the buildings of city such as buildings with steel framing, ferroconcrete, block and joists, wood and mud bricks, cement and iron and adobe.

• dating back of Buildings: this is a basic parameter in Evaluation of the vulnerability. Time conditions are affecting the amount sustainability of buildings.

• Size of fragments: there is more vulnerability risk for cities which have the kinky texture Because of the vulnerability of smaller denotative parcel.

• Number of floors: The importance of this is that if the number of floors to be added to a home, more people is living in it. The building weight, Seismic capability and Vibration conditions will be more at risk.

• Land Use: Low or high vulnerability in a district that is depending on usage. Therefore, this study uses three types of "high-risk land uses, medium-risk Land use and low-risk" vulnerability against the earthquake.

Second step: data importance determining

After determining the parameters, a Weighting Table was made, with consulting by professors of various universities for identifying our parameters and their ranks among themselves. They allocated in columns by using number 1 to 9. 6 indices mentioned in different classes with different degrees importance were rated. Accordingly, number 9 is most important indices of the vulnerable to earthquakes and Indicator number 1 is allocated to the

least important. The weighting factors are shown in Table 1.

Third step: determining theoretical basis and assumptions weighted

At this stage we consider the assumptions for the six Indicators. This is an example of a building with fewer floors, have the lowest level of vulnerability. Because they have less weight, populated less, less height and less oscillate. Whatever the new buildings are less vulnerable. And the vulnerability of the poor quality construction is higher. Dating back of Buildings is divided into six classes and that is if city building ages are more than 30 years, we are the most vulnerable. In general it can be said that Lower quality buildings, less compatible land uses and smaller fragment size Are effective in increasing the quantity vulnerability. Whatever be the less of buildings' age and Floors in addition with Better quality, building materials would be less vulnerable (Paknezhad, 1392: 57).

Fourth step: produce maps each parameter and their vulnerability

At this stage the index map have been made on the current status and weighted maps.

Step Five: integration the maps and the vulnerability map of the study area

In this part the scores obtained in the previous maps was merged to produce final vulnerability map.

Analysis and Conclusions

To determine the vulnerability of the city of Chalus, six parameters were used such as quality of buildings, construction materials, dating back of Buildings, number of floors, Size of fragments and uses existing land use, and the vulnerable points were determined. All parts of the study area are same in near the fault. The result of this work, the map of the seismic vulnerability of the region that is most affected region is in the South and East. In general the following results: According to The vulnerability map of the area, places where the buildings made of durable materials, better quality and less density of building have been better in terms of vulnerability. Therefore, these areas are classified according to the level of vulnerability is in the low and very low vulnerability. These areas are located in the north central street city, Primary areas of Abrang district, and the end points of radio darya St. and near the Oil depots to the west of study area. Generally, these areas density have been less at the case study area. The most significant in this trend is that the extent of damage to the south are going to be more. It is because of the high construction density and Maximum small houses. This situation the can be seen in southern and western regions of the radio darya St. Abrang district and the endpoint of market are the first urban cores of Chalus. Narrow Width of streets, tiny texture, Low quality of buildings, the old buildings and are cause of being these areas of highest vulnerability level in the study area.

Table 1. Indexes weighted according to the importance

main vulnerability parameters		very low vulnerability	Low vulnerability	Medium vulnerability	High vulnerability	Very high vulnerability
Building Material	Truss	*				
	Concrete	*				

	structure						
	Brick and Iron		*				
	Blocks and iron			*			
	Clay,brick and wood				*		
	Wood and Clay						*
dating back of Buildings	+50						*
	40-50				*		
	30-40			*			
	20-30		*				
	10-20	*					
	-10	*					
The quality of building	New Homes	*					
	Maintainable	*					
	Restoration						*
	Destructive						*
Size of fragments	Less than 250 meters	*					
	Between 250 and 500 meters		*				
	More than 500 meters			*			
Number of floors	1 floor	*					
	2 floors		*				
	3 floors			*			
	4 Floors and More				*		
Land Use	Residential			*			
	Commercial			*			
	Education and health				*		
	Facilities and Equipment				*		
	Religious and cultural		*				
	Tourism and recreation		*				
	Administrative and Military				*		
	Wasteland Garden	*					

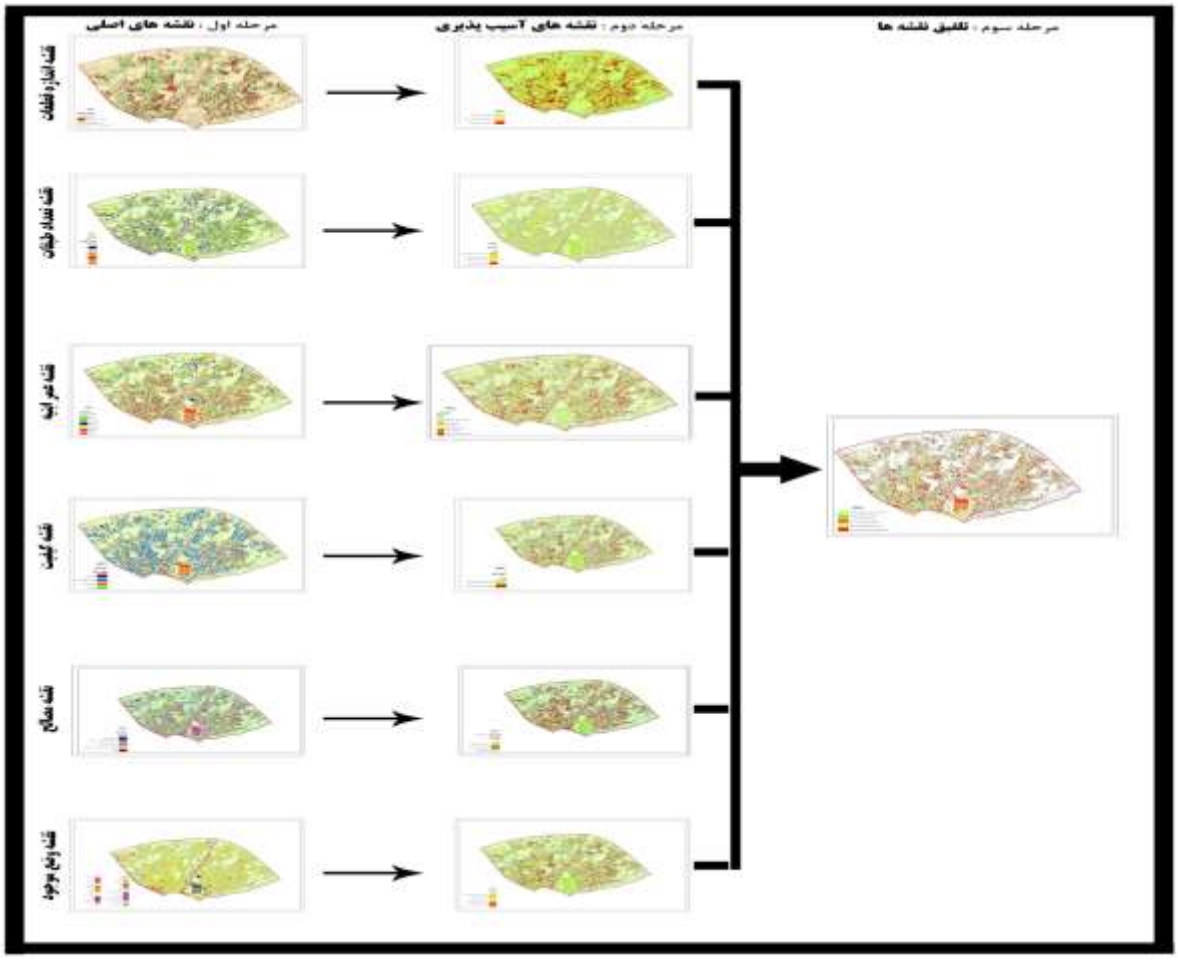

Figure 2. Vulnerability Stage assessment based on each parameters

Figure 3. The ultimate vulnerability map

Strategies to reduce vulnerability:

Preparation of area faults database increase awareness about Building immunization.
Educate and motivate people and provide facilities for building a principled and committed.
The use of lightweight materials and refractory the process of building.
Specialized manpower training in urban planning and seismology commissioned a working group called the Committee of vulnerability City Chalous.

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