An Analysis of Iran's Cities Distributions in Related to Earthquake Hazard

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Abstract

Natural disasters such as earthquakes often result in extensive casualties and damage. The location of Iran and many other developing countries in active tectonic regions of the world emphasizes the necessity to develop a comprehensive disaster management system. Iran is located in the Alpine-Himalayan seismic belt which is one of the most active tectonic regions of the world. Iran is a country with about 75 million people living and the history of the region indicates strong earthquakes. Population centralization in urban area and metropolitans with environmental disaster, especially in developing countries such as Iran increase metropolitan's vulnerability against earthquake hazard. Iran is a vulnerable against earthquake hazard, because of distribution of cities and population centralization in its metropolitan. But the amount of damage and injured in an earthquake in Iran's cities is different. Population growth with increase of cities number cause to sustain a loss of people and appurtenances. This research tries to help to planning for earthquake crisis. Type of research is applied and method of data collection is documentary and methods of analysis are; population analysis with urban system analysis and urban distribution system in related to earthquake hazard. In beginning the situation of urban system and locations of cities are studied, than the relationship between distribution of cities and earthquake hazard studied. This paper examines the spatial distribution of the population and focusing on urban system patterns.

Keywords: Iran's Cities, Distributions of Cities, Earthquake Hazard, Urban System.

1. Introduction

A disaster is a perceived tragedy, being either a natural calamity or man-made catastrophe. It is a hazard which has come to fruition. A hazard, in turn, is a situation which poses a level of threat to life, health, property, or that may deleteriously affect society or an environment. Planning for crisis, especially urban crisis in variable angles must be analysis and review. This discussion is interested in some sciences such as urban planning, environment science and crisis management. This topic is very important, because of related to life and property of people. Basically, researches can important role in decrease of manmade and environmental hazard. Developing countries suffer the greatest costs when a disaster hits – more than 95 percent of all deaths caused by disasters occur in developing countries. A disaster can be defined as any tragic event with great loss stemming from events such as earthquakes.

Various disasters like earthquake are natural hazard that kill thousands of people and destroy billions of dollars of habitat and property each year. The rapid growth of the Iran's population and its increased concentration often in hazardous environment has escalated both the frequency and severity of natural disasters. Among various natural hazards, an earthquake is the major disasters adversely affecting very large areas and population in the Iran. For few decades, the population of cities in developing countries, including Iran had a higher growth rate than the total growth rate of countries' population. The cities in the developing countries have become areas of very high vulnerability to natural hazards, where effectively, more than 40% of the urban population is directly or indirectly threatened [1].

Controlling the development of land on or close to active faults is a Resource Management Act 1991 issue. The guidelines provide direction on land use planning approaches for land on or close to active faults. They aim to assist planners, emergency managers, earth scientists, and people in building industry to avoid or mitigate the fault rupture hazard[2]. Many large cities in developing countries are subject to natural hazards .At global scale, large natural hazards are associated with unplanned and poor cities [3]. In fact the main pressure which threats our lives is because of hasty urbanization without analyzing the hazard risk [4].

While in developed countries, the development of the big cities began centuries ago and generally allows for controlled and planned urban expansion, the opposite is the case in developing countries, where rapid urbanization's process is characterized by an unplanned urban expansion. The developing metropolitan cities have enormous difficulties in coping both with the natural population increase and the urban physical expansion. In fact, urbanization process increases the vulnerability through centralization of human and property. Because of unplanned urbanization, growth of land in vulnerable areas with a high level of hazard risk, inadequate urban management and unsuitable construction measures, third world cities transform into vulnerable centers. If cities grow rapidly, without any plan and attention to the observance of urbanism regulation and factors resistance, it will cause an increase in urban vulnerability. This case deteriorates when the metropolitan cities extend on or close to active faults. On the other hand, urbanization programs must be based on natural hazard knowledge. Suitable location for residence and logical development of cities has a basic role in the decrease of earthquake damage [5].

2. Seism tectonic and seismicity of Iran

The Iranian plateau can be characterized by active faults, recentvolcanic and high surface elevation along the Alpine earthquake belt. Tectonicstudies indicate that the Iranian plateau has a very high density of active andrecent faults. Earthquake data of Iran show that most activity is concentratedalong the Zagros fold thrust belt while less activity is observed in central andeastern Iran. Thus, several regions are vulnerable to destructive earthquakesThe preparation of an earthquake hazard map is the delineation of theseism tectonic province and the assessment of the associated maximum earthquakepotentials[figure 1]. The boundaries of the provinces are established through analysis ofseismic history, relocated epicenter for the past several decades; tectonicenvironments, active faults, regional geomorphology, and plate boundaries.

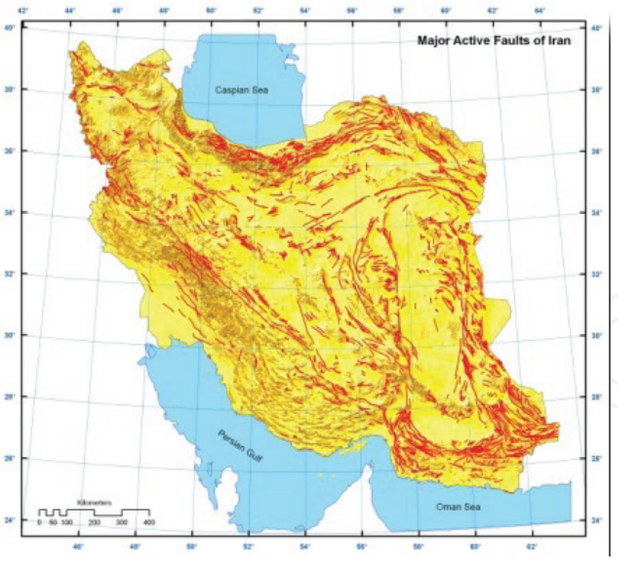

Figure 1. Major Active Fault of Iran

3. Population Analysis

Iranian cities are usually the heart of economic and cultural changes that have occurred after the Islamic revolution in 1979. These cities are increasingly having impacts via political–economical arrangement and chiefly by urban management structures. Structural features have led to the increasing growth of cities and urbanization (in number, population and physical frame) and the main problems in them. For instance, housing, water supply, traffic jams, social welfare, security, safety and health, etc. The beginning and continuation of the war with Iraq accelerated these circumstances. After the war, population movements resulted in a number of urban changes, such as

Local people moved from war-stricken regions to others, especially to cities; Young men moved from rural areas to towns and then to cities; Foreign migrants moved from such countries as Afghanistan and Iraq to Iran. On the other hand, because of the lack of birth control policies and also because of the deceptive attractions of cities, particularly big cities, the birth rate has shot up, something which has occurred mainly in rural regions and small cities.

The population of Iran has increased rapidly since 1956. The 1956 and 1966 decennial censuses counted the population of Iran at 18.9 million and 25.7 million, respectively, with a 3.1% annual growth rate during the 1956–1966 period. The 1976 and 1986 decennial censuses counted Iran's population at 33.7 and 49.4 million, respectively, a 2.7% and 3.9% annual growth rate during the 1966–1976 and 1976–1986 periods. The 1996 count put Iran's population at 60 million, a 1.96% annual growth rate from 1986–1996 and the 2007 count put Iran population at 72 million. The reasons of the recent decline in the annual population growth rate are attributed partially to the government's family planning efforts since 1989 and the dismal economic conditions and general decline in living standards for the average Iranian household. The urban population of Iran has nonetheless been rapidly growing from 1956 to 1986. It has expanded about 2.6 times in the period 1956–1976, and doubled again (2.52 times) from 1979 to 1996. The number of cities in Iran has gone from 199 to 393 and 614 and 900 and 1012 during the periods 1956–1976, and 1996–2007 [6].

4. Cities and urbanization in Iran

Rural to urban migrations are the major reason for Iran's rapid urbanization. The employment opportunities and declining living conditions forced the rural population to migrate. In 1956 only one Iranian city (namely Tehran), had a 500,000 population, whereas 9 of the nation's 199 cities had a 100,000 population or more; about 53% of the total urban population lived in cities with 100,000 or more. In 1976, only 23 (6.2%) of 373 cities in Iran had population of 100,000 or more, and, only four cities had population of 500,000 or more. In this year 28.6% of the urban population of Iran lived in Tehran.

By 1996, nearly 10% of 614 cities in Iran had a population of 100,000 or more and nine cities had a population of 500,000 or more. 36.8 million People lived in urban areas, 8.4% lived in Tehran, 41.8% in the nine largest cities with populations of 500,000 and more. Thus, the country's largest city (Tehran) had a very rapid population growth. In 1956, 1976 and 1996 its population had reached 1.5, 4.5 and 6.7 millions. Similarly, the population of the Greater Tehran Metropolitan area had reached about 10.5 millions from 1956 to 1996. Several conclusions can be drawn from the urbanization analyses in Iran during 1956–1976 and 1976–1996. First, Iran's urban population increased by 5.9 million to 15.9 and then 36.8 millions in a period of 40 years. Second, Iran's hierarchy of urban settlements had only one city in 1956, four in 1976 and nine cities in 1996 with a population of half a million or more. This represents a major gap in the hierarchy of urban settlements. Third, the number of large cities (defined as those with a population of at least 250,000) went from 3 to 8 and then to 23. Their share of the urban population increased from 31.6% to 47% and then to 61.3% of Iran's total urban population. Fourth, the number or medium-sized cities (with a population of 100–250,000) grew from 15 to 36, while their share of total urban population decreased from 42.5% to 15.4% to 13.9% during 1956–1996. This indicates that rural and urban migrants generally did not consider the medium-sized cities as their destinations and moved to large cities to take advantage of greater opportunities there. Fifth, the number of small cities (<100,000) increased from 190 to 533, while their share of the total urban population decreased from 49.1% to 31.3% [7].

5. Primacy City Index (PCI) in Iran

Almost all censuses after the revolution have revealed a continuation of large-scale urbanization and an increasing tendency towards the concentration of urban population in a few big cities. The proportion of urban population to the total population of the country in 1976 reached to 46.1% while in 1996 it increased to 61% and increased to 72% in 2010. Both the increase in the number of urban places and population increase in cities have contributed to the process of urbanization [8]. After the revolution, the number and population of cities continued to increase as before. These changes are shown in[Table1]. A recent major policy of urban economic and industrial decentralization is a persistent program of the government. The policy has been identified as a result of the massive growth of Tehran in recent years, up to 9 million by 2010. Part of the growth of the capital resulted from the lack of economic opportunities elsewhere and in order to redress the developing primacy of Tehran and the internal pressures which it is undergoing, the policy of decentralization is to be implemented as quickly as possible [9].

Year	1959	1966	1976	1986	1996	2007	2010
Total Population	18500000	25789000	33709000	49445000	60055000	70495000	74733230
Urban Population	5997000	9794000	15855000	26845000	36700000	48259000	53637652
Number of Cities	199	271	373	496	617	1012	1025
Urban Population (%)	31.4	38.7	46.1	54.3	61.3	68.4	72.77

Table 1. Trends and the number of urban population in Iran 1976–2007
Source: [8]

The characteristics of the urban system of Iran can be enumerated as follows:

1. High concentration of economic and commercial investment in several big cities, especially in Tehran, and the lack of control over it. The process of urbanization in the country has been accompanied by an overconcentration of productive activities and economic forces in big cities;

2. High concentration of social, cultural, educational and welfare facilities in the above-mentioned cities, which is mainly resulting from the lack of equal distribution of the capital and equipment in the totality of regions and cities.

3. Physical and spatial expansion of big cities and their irregular growth; in spite of the recent reforms (such as renovation plans), in the old cities or some of the sections of ancient cities, cities often have had not proper physical form yet and in the regional level they had not harmonious distribution spatially. This is affected by two factors: the first is the climatic and natural situation; the second is the national policy and planning.

4. Processes of urbanization lead to urban primacy, regional inequalities, centralization of political and economic power within cities and intra-urban ecological segregation and environmental crisis; this process has intensified because there is no accord on the necessary principles of urban sustainability within development [10].

Year	Population	Changes		Changes index 1957=100	Changes in proportion to base year	Annual growth (%)
		Absolute	Proportional			
1957	18954704	-	-	100	-	-
1967	25788722	6834018	36.1	136.1	36.1	3.13
1977	33708744	7920022	30.7	166.8	66.8	2.71
1987	49445010	15736266	46.7	213.5	113.5	3.91
1997	60055488	10610478	21.5	235	135	1.96
2007	70495782	10440294	17.3	252.3	152.3	1.62

Table 2. Population changes in Iran 1957- 2007
Source : [8].

Iranian cities are not often 'self-contained', and cannot act independently from their nation and region. Dependent urbanism not only leads to uneven urban hierarchies and high levels of 'intra-urban inequality', but also creates cities that are more likely to be economically 'parasitic' on the surrounding region than 'generative'. Therefore, today we are witnessing an increase in the gap between regions and cities and the creation and spread of squatter settlements or poor housing, especially in the suburbs. Certainly, several projects have been developed in order to reduce the inequalities of urban development, but none of them have been executed completely[Table2].

6. Cities at Risk

The beginning of changes in the process of urbanization in Iran goes back to the Qajarieh period (1906) the offices, embassies, new buildings, theaters, movies, shops and hotels were built according to new styles but without planning and discipline. In the first Pahlavi's period (1921), the changes had been without proper planning and mostly on the basis of modernization, which included the advent of machines, new building, offices, ministries, embassies, new urban laws, changing streets, etc., and also changes in economic, social and cultural ways, not only in Tehran but in the other cities of Iran. But up to 1948, no national, regional or urban planning had been undertaken in Iran.

In the first decades of second Pahlavi era, the Iranian government implemented five national development plans (1948–1978). Together, these plans reflected a gradual shift from agriculture to industry and from subsistence agriculture to large scale capital intensive commercial farming [11].

In the post-revolutionary period, the two national development plans were prepared in the same way as prior to 1979. The authorities were concerned with planning, war, and expansion of the universities, relying on oil income. The urban development exceeded the pre-revolutionary period; the peripheries of large cities expanded and the urban indices of centralization increased [12]. The traditional building forms of the cities and the tendency toward modernization had been increased[figure 2].

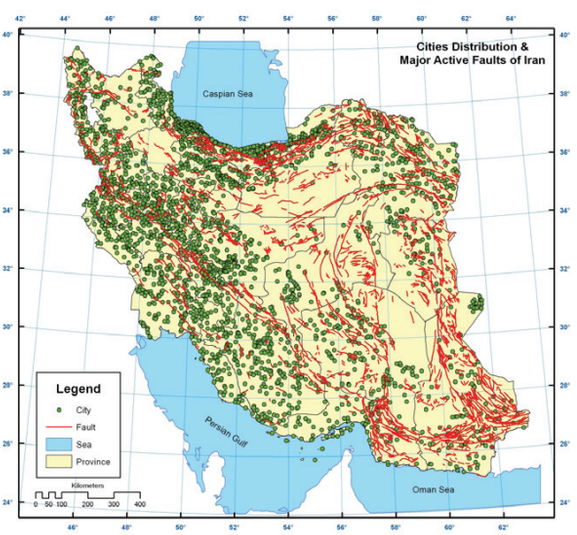

Figure 2. Cities Distribution and Major Active Fault of Iran

7. Conclusion

The sustainable urban expansion has become a key point in the context of urban studies. The management of the urban growth on the safe lands is the main issue in developing countries where the urban areas experienced rapid urban physical growth. In this study, we examined the relationship between urban extent and active faults around the cities. In general, the results of this paper are summarized as follows:

Demographic changes have become a main reason in transforming the urban dynamics. One of these dynamics is urban growth that causes uncontrolled and rapid expansion. The rapid growth of the Iran's population and its increased concentration often in hazardous cities has escalated both the frequency and severity of natural disasters.An earthquake is the major disasters adversely affecting very large cities and population in the Iran. For few decades, the population of cities in Iran had a higher growth rate than the total growth rate of countries' population. The cities in the Iran have become areas of very high vulnerability to earthquake hazards.

8. References

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