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Research Article

THE STUDY OF CRISIS MANAGEMENT IN NATURAL DISASTER REDUCTION IN ELECTRONIC MUNICIPALITY

***Mohammad Sadeq Azizian[1], Shouresh Karimi[2], SeyedFarid Hosseini[3], Alireza Zeynali[3] and Saqar Javaheri[3]**

[1]Applied Sciences University of Kurdistan Province, Center of Sanandaj One,
[2]Department of Architecture, University of Applied Sciences, Center of Culture and Art (Soroush) in Kurdistan
[3]Lecturer in Applied Sciences University of Kurdistan Province
**Author for Correspondence*

ABSTRACT

The development of cities and urbanization and gradual increase in the number of great cities in the world, especially in the developing countries such as Iran in one hand, and urban growth, concentration and centralization of the population and increase in environmental and economic loads on their context on the other hand, have led to paying more attention to the cities along with acceptation of numerous roles and functions. One of the subjects most of the world's major cities are grappling with is the natural disaster subject. Regarded to the unexpected nature of most of the natural disasters and the need of operating and making quick and correct decisions, the fundamental and theoretical principles have made knowledge under the title of crisis management. In the meantime, with the advent of electronic services and benefiting from the Information Technology as a suitable tool to provide integrated services for people, an appropriate context has been provided for creation of electronic municipality. With the formation of electronic municipality, the speed of providing services and making decisions for the managers and as a consequence the speed of operation in critical conditions increase. The importance of increase in decision making speed in critical conditions is so much that the right decision making in the early hours and in natural disasters can prevent from many human tragedies. We can help the decision maker managers to make more intellectual decisions in limited time with the design of software systems including informational bank systems and expert systems. Today, the crisis management informational systems are considered as a significant part of electronic municipality. The aim of this study is to investigate the crisis management in reduction of the natural disasters for the electronic municipality. The research method is descriptive analytical method using library resources and documents.

Keywords: *Crisis Management, Electronic Municipality, Earthquake, Natural Disasters*

INTRODUCTION

The development of cities and urbanization and gradual increase in the number of great cities in the world, especially in the developing countries such as Iran in one hand, and urban growth, concentration and centralization of the population and increase in environmental and economic loads on their context on the other hand, have led to paying more attention to the cities along with acceptation of numerous roles and functions.

One of the subjects most of the world's major cities are grappling with is the natural disaster subject. Regarded to the unexpected nature of most of the natural disasters and the need of operating and making quick and correct decisions, the fundamental and theoretical principles have made knowledge under the title of crisis management. This knowledge refers to a series of activities which are done before, after and during the crisis to reduce the effects of these disasters and to decrease vulnerability. This subject has a certain relationship with the urban planning discussions and urban management and geography. Using the urbanism principles and explaining the concepts in this knowledge such as form, texture and structure of the city, urban land use, communicational networks and urban infrastructures, etc. we can greatly reduce the consequences and effects of the natural disasters.

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Iran's geographical context is from the most vulnerable parts of the earth in terms if the possibility of occurrence of these events especially earthquake and every year, these incidents cause great life and property losses and the urban contexts have always had bitter experiences of such disasters; and it seems that certain planning is necessary for immunization of urban spaces as more as possible. Cities are severely hurt due to the concentration of population and economic investments; these spaces have selected a certain form and structure to develop from the beginning and also they have been spread over time. Relying on the geographical data and with explaining its concepts and principles using this data, the urbanism knowledge can apply the managerial principles in order to reduce the vulnerability of the cities against these incidents. In the meantime, creating city and electronic municipality has many effects in the economic, social, cultural and political context of the city. Development of electronic commerce, electronic banking, and development of using credit cards, reduction of paperwork, reduction of service provision costs and creation of a field for domestic and foreign investment are from its effects in the economic field. Providing online services for the citizens increases their satisfaction from the public and private services and makes it possible to form many online societies and groups and also provides online voting and equitable distribution of facilities. Making the context of using the ideas of citizens in urban management is from the social effects of applying the electronic municipality project. Also in the cultural fields, applying electronic municipality will be followed by many impacts; for example transparency, informing, virtual training of citizens in the general and specific spheres, the possibility of timely publishing digital media, news and other information for citizens and many other cultural impacts (BeygBabaei, 2007).

Investigations indicate that one of the most important expectations of the citizens from the electronic municipality is providing services and increase in decision making process of managers. The organizations of crisis management are from the organizational parts which are defined in most of the municipalities and local governments. In many cities of the world, the crisis management duty is done by several organizations (in non-integrated form) and the coordination between various organizations and the importance of the speed of coordination in the early hours of crisis has been always controversial. Fortunately, with the electronic developments especially in the recent decade, the possibility of designing informational systems for crisis management has been provided; systems which are as the integral part of electronic municipality nowadays.

Every day, we deal with various crises with different typologies, the natural, social, cultural, and even political crises which are capable to turn into each other in most of the times (Rajab Beygi, 2003). Cities have bodies and each of these bodies has placed an activity in itself and the whole of them make the urban space and give it identity. The city is defined with the human concentration centers and human activities and buildings. The urban space has placed the infrastructural facilities with a variety of uses including residential, office, service, health, etc. within itself. All of the above will be followed by a dependent population which is severely influenced by them in case of the occurrence of natural disasters and this causes libertinage of the life system and great life and property losses in the cities. From the important factors which cause major attention to this subject in urban spaces are huge investments and environmental loadings and intense population concentration and in case of the occurrence of such disasters, necessary planning must be thought in order to prevent from the possible losses or reduce them. Today, urban needs and housing demands and rural to urban migration have led to the excessive growth and development of large cities like Tehran. Lack of attention to the correct positioning of cities, growth and development of the established cities, and also the lack of necessary programing for prevention from the uncontrolled development of cities will result in many problems and issues for them in terms of safety.

Urban development has caused the cities to be built on the main paths of faults or within the scope of rivers or ravines. Disasters do not know the limitations and ports; perhaps, if some of those such as earthquake occur in areas far from the cities, they will result in so many damages for the cities. We must note that some aspects of these damages are the result of invasion of river limits and ravines by human for

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indiscriminate use of urban lands; and at the time of floods or wet seasons, this cause that all of the buildings to be damaged, also this is true when earthquake.

Regarded to the location of Iran in terms of natural disasters and the fact that it has always suffered from many damages and losses due to these disasters, also according to the vulnerability of most of the country's cities against these disasters and the significant aspects of their effects n critical conditions and their devastating consequences, in this paper, we try to explain the role of urban development (urban planning and urban designing) in earthquake crisis management, that is to say that the general guidelines for reduction of the consequences of natural disasters in urban limits and necessary planning and designs for immunization of cities against these disasters will be explained.

RESULTS AND DISCUSSION

Discussion and Conclusion

Definition of Crisis

In terms of pathology, crisis is the break of the whole or some parts of the group's or society's activity which is developed with life losses, property damages and environmental hurts and the society cannot compensate it with its resources (Bahreyni, 1996). Crises are divided in two categories of sudden and gradual in terms of the occurrence speed and also are divided into two groups of natural and human made in terms of factor.

There is no general agreement in defining this word. In fact, more than 40 various definitions have been seen for this word. According to the definition of the World Health Organization, crisis is the severe environmental – psychological and social clutter which goes far beyond the adaptive capacity of the society suffering from it (Hamidi, 1995).

In order to recognize the common properties of all crises, we will deal with the common aspect of all of them:

1. Break in usual flow of people's living: the most important characteristic of a crisis is the break of the usual flow of people's living in populations. Of course, this break is extemporary and the time of the break depends on the severity and the size of crisis.

The primary needs of living including housing, physiologic needs, security, emotional needs and mental comfort are all broken and disturbed and consequently, the usual flow of the people's living will be disordered.

2. Interruption in services, production and communication: the economic activities of the society such as production, provision, consumption and services and also communication are interrupted in critical conditions. The reasons of this interruption are: threating human's life and workforce, human injuries and mortalities, psychological factors, environmental problems and tensions, etc.
3. Property damage: one another characteristic of crisis in the property damage which is very significant and considerable in any kind of crisis.
4. Life injuries and losses: generally, most of the crises can have life injuries and losses, from the simple injuries to organ failure (disability) and mortality.
5. Environmental degradation: most of the times, crises have negative environmental effects and sometimes they cause irreversible damages to the environment. Air and water pollution, habitat degradations, lack of water and food, and misbalancing of the ecosystems are from the consequences of crises with natural, technological, political and social resources.
6. Emotional and psychological issues: one of the important effects of crises is emotional and psychological issues for the humans including emotional conflicts, violence, depression, despondence and ultimately fieriness, sinning, offence, guiltiness and suicide.
7. Social problems: poverty, unemployment, migration, ethnic and cultural differences, disintegration of families, lack of healthcare and welfare, increase in misdemeanor crimes, false jobs and offence are from the problems following the crises in the societies (Abdollahi, 2004).

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Crisis Management

Crisis management is a series of executive activities and managerial and political decision makings based on different steps and all levels of crisis in order to save people, reduce damages and losses, prevent from living interruption, produce service, keep communications, save environment and ultimately repair and rebuild the damages, etc.

Regarded to the above definition in which clearly we explain the decision making step as one of the crisis management, the need of an informational system for crisis management is felt; since management is not done in vacancy, the informational system is not also created from the vacant information; therefore, regarded to the 7 major characteristics of all crises and also the operations needed for managing crises, we need to design an informational system of crisis management.

The duties which must be done in crisis management are generally as follows:

1- Identifying and evaluating the crisis: crisis management severely requires exact identification of the critical condition; identifying crisis is having a clear image from the conditions before and after the crisis, objective imaging of its damages' effects, losses and consequences. In this step the following measurements must be done by crisis management:

_Data collection: like the other duties in crisis management, data collection must be done fast and carefully, this data includes:

- Adjusted and written data including maps, aerial satellite photographs, reports and statistics related to the troubled area.
- Reporting the occurrence or beginning of the crisis by supervisors or informational systems.
- Visiting and aerial photographing
- Observations of exploratory groups including the qualitative conditions, estimations, measurements and preliminary notes.

As it is clear from the nature of this duty from the crisis management duties, the role of informational system of crisis management can be very significant in this section; having the local information of the troubled area before the crisis, such as city maps, road maps, fuel and water storage centers, we can make decision more effective and efficient.

_ Crisis evaluation: having the size and severity of the crisis helps manager in providing the requirements and adjusting the operational plans. Regarded to the variety of crises, it is necessary to use some criteria to measure them. Hence, the most appropriate criteria to compare the crises relate to the variables of their common aspects. As it was previously noted, the common aspects of crises are their effects, damages, and losses.

2- Percussion planning: planning for controlling crisis includes four steps, first, the disasters must be predicted, then the contingent plans must be adjusted, after that the operational groups of crisis management should be trained and organized, and finally they must be practically done in order to complete the plans (Jalali, 2001).

Also in this step, the role of informational system of crisis management is very significant. Crisis planning is usually done regarded to the past experiences in a society or the other societies and before the occurrence of the crisis; keeping information related to the previous crises such as time, personnel, expertise, materials, facilities and tools can be done through the informational system of crisis management.

3- Organizing operational groups: the operations of crisis control and operational emergencies must be completely professional and independent but concentrated and coordinated; the dependency of different movements is to the extent of a comprehensive management and they have a united director and logical coordination. Regarded to the information related to the organizations performing in the crisis, and the list of workforces and expertise they can give the crisis manager, we can have a variety of reports about types of groups and their components in the informational system of crisis.

4- Decision making: decision making is one of the most important measurements in crisis management; we usually experience a contradiction about decision making in crises, firstly, we need high quality

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decisions in crises, and secondly, due to the time constraints, it is not possible for us to make right decisions; the informational system of crisis management will be very useful in solving this discrepancy.
5- Budget and resource allocation: one of the tasks must be done in crisis management is to allocate the budget and resources for both crisis operational groups and the people in crisis; and this task cannot be done without having information from the current resources and also the needs of different people and groups.
6- coordination: crisis management requires task division and designing units and groups. Since the crisis management operation is a multi-organizational activity and most of these organizations are very different in terms of purposes and duties, the informational system of the crisis can be very useful; for example, registering the information related to different groups and organizations and their expertise and their facilities and resources. The measurements which must be done to react to the crisis are listed as follows:

- Informing or warning about the crisis
- Evacuation or migration
- Rescue
- Evaluation after the crisis
- Emergency normalization and optimization
- Transportation and transfer
- Communications
- Meeting the survivors' demands
- Security
- Emergency actions
- Rehabilitation and reconstruction (Ahmadi, 1997)

Electronic City, an undeniable need
In 20 recent years, the global approach has been toward making societies informational and now, it is toward a developed society which is faster and more capable in terms of producing and transferring data.
Regarded to the new technologies which are followed by the complexity of social living, we need to facilitate different tasks of life and it is not practical and performable without paying attention to the technology.
Currently, Information Technology provides this possibility for the people and helps them achieve their purposes faster. Creating electronic city and taking steps on IT path is also an undeniable chance.
This city is a factor in order to create glass organizations in the way that all of organization's functions and purposes be clearly visible.
Electronic city makes it safe and certain for the citizens to electronically access to municipality, governmental organizations, economic enterprises and all urban cultural and health services for circadian.
This city benefits from a developed context of telecommunication information in the way that in which we can communicate with homes, organizations and other places through computer (Habib, 2003).

Advantages of Electronic City

From the economic advantages of implementation of electronic municipality we can mention the reduction of urban traffic costs, increase in investment as a result of the development of global communications, saving limited fuels, facilitation of doing economic activities due to being 24 hours of service, etc.
Reduction of the wasted time of citizens in traffic, better provision of services, increase in jobs and improvement of stable urban management are form social characteristics of electronic city.
Also, the most important cultural effects of this city include fast informing, publication of electronic magazines for citizens, virtual training, creation of digital libraries, and increase in literacy and also creation of a kind of worldview which helps increase prosperity and promote culture.
In fact, the electronic city is not as a bod including high building, traffic streets and environmental pollutions anymore; but it is a city in which the interaction among citizens and authorities is more important and these are two-way interactions creating desirable environment for citizens.

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This is significant especially for large cities. In electronic city, large cities are not cities with high skyscrapers, huge cinemas, large salons as places for interaction, etc., but they are cities that human can watch great movies in small screens, visit museums at the back of his desk and generally there is no need of previous urban frameworks anymore. In fact, electronic city means citizen-democracy in urban management.

Many activities done in usual cities can be done electronically and in the form of electronic city; perhaps, it may be said that these series of activities are easier done in electronic cities (Hamidi, 2007).

Activities of Electronic Cities

Many activities done in usual cities can be done electronically and in the form of electronic city; perhaps, it may be said that these series of activities are easier done in electronic cities.

Activities done in an electronic city can be divided into some categories which some of them will be mentioned as follows:

- Banking activities: such as paying bills, withdrawing money, money transfer, etc.
- Administrative activities: such as Real State Registration, passport application, etc.
- Business activities: such as buying and selling goods, music, movies and food
- Recreational activities: such as computer games, visiting museums and parks
- Obtaining information: news, newspapers, magazines, weather conditions, urban traffic, aircrafts flight times, etc.
- Scientific activities: researching about projects, finding articles, access to reliable sources, libraries and new books and publications
- Educational activities: school, university and other institutes
- Political activities: participation in elections, give opinions to the parliament and open political sectors
- Travel activities: booking travel ticket, hotel reservation and car rental
- Employment and job application: becoming aware of job opportunities, filling out job application forms, sending and getting results
- Therapeutic activities: visiting the doctor, getting safety instructions and informing of the medical news
- Decision making activities: the best and most deserted path in the city to get to the arrival, the best restaurant, the best recreational places and the other bests (ShadiTalab, 1992).

How is the Electronic City?

For better understanding and answering this question we present some examples: for instance, the person who wants to build a building and demands the permission from the municipality, after entering he municipality's informing network enters his required services as well as the properties of his own land and his desired building in the network, then, according to the current standards, electronic municipality informs the size of buildable area and the stories of the building to the demandant and ultimately, the demandant agrees with one of the consultants according to the plan and price by entering to the Consulting Engineers Network and with the municipality license.

In this stage, even the demandant is able to observe the provided plan by consultant engineers in 3D form on the computer screen and apply his desired reforms.

After confirming it by the electronic municipality and licensing, this plan enters to the network of contractors and with the selection of the best offer in terms of price, it gets to the stage of signing the contract and then it is applied.

Even presenting the reports by the contractor to the employer can also be done through the network. The entire process can be finished in the smart network in less than two hours, while in the usual conditions the mentioned stages require 1 to 2 years to be complete.

Also in the field of urban transport, one another feature of the electronic city is that if all vehicles be equipped to the local positioning system, they can identify the geo-location in all the way and also the police can manage the traffic in this way.

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Moreover, typically no accident occurs in such a system because in case of the possibility of collision between two moving vehicle, they can prevent from the accidents with timely warning in one km before the predicted location of accident.

In fact, the traffic accidents are controlled with this method and even they are recorded on the computer screen of police and there is no need of re-informing.

Hence, in addition to increasing the speed of arrival of police to the scene, there is no need of drawing sketch and the same thing facilitates insurance companies' task compared to the past.

Also, imagine that in a digital city, to what extent the existence of smart system can develop the emergency services.

For instance, consider someone who experiences heart attack in one hand and his life or death depend upon any single second, and on the other hand, the emergency center cannot be sure about the rightness of each call; in this condition, the smart system makes it possible for the emergency center to see the location of the caller and even his/ her owner's name as soon as the phone call is connected.

On the other hand, the location of accident is shown on the ambulance's monitor and geo-informing system (GIS) informs the emergency center about the nearest ambulance to the injured person and also the shortest path to the destination and the nearest medical emergency center and hospital are determined.

Thus, the locative information, moving path, speed and location of the vehicles including public vehicles, police, fire trucks, ambulance, buses and other vehicles are available by using the smart navigation system under the plan of electronic city.

The significance of this subject becomes clearer when we note that the desired navigation systems are those systems with the possibility of changing maps and using the updated maps of the country and with the capability of transportation and favorable and suitable price which are easily available in the market.

Implementation of Electronic City

Basically we suggest four stages to implement the pattern of electronic city or municipality. In the first stage named appearance stage, it is necessary to prepare the strategic document based on the field studies from the current facilities and potentials.

In this field, using the global experiences is also useful. Then, the development of infrastructures and educating the employees of offices or the dependent organizations to the municipality are done.

In the second stage named promotion stage, the electronic city or municipality starts its work with the presentation of the primary services on the internet through the designed websites.

In the next stage named interaction stage, some activities are performed for training users and citizens of electronic city and totally the two-way interaction between urban managers and the citizens is created through websites.

In the stage of integration which is considered as the final stage of creation of electronic city, the domain of services provided for citizens developed and more various services are provided.

In implementation of electronic city we must pay attention to the presentation of electronic lifestyle which fits the era and we should note that the traditional lifestyle will result in contradictions and certain abnormalities for the informational society.

Thus, one of the plans of electronic cities is an appropriate pattern regarded to the cultural and social conditions of the desired society which fits the informational society.

Of course, due to the fact that the development of electronic cities will be accompanied by many achievements for the citizens, urban organizations, and the other beneficiaries of the city, I am sure that in case of implementation of planning based on the global priorities and current realities of the world which is moving toward the informational society, the implementation of electronic city will be prioritized.

The Position of Urban Texture and Structure in Reduction of the Vulnerability after Earthquake in the Cycle of Crisis Management

Body Elements of the Urban Structure and Vulnerability

It is obvious that concepts like the city's structure, the city's texture, the city's form, the density and communicational networks of the city can be influential in the purposes of the reduction of the city's

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vulnerability against earthquake and natural disasters and this is due to the same matter that it is necessary to organize and design these concepts:

Urban Structure

The spatial distribution of the urban elements and the how main functions and elements of the city are composed and placed together form the urban structure. Body divisions of urban structure (alleys, localities, and region) and the type and centrality of urban elements and being single-centered or multi-centered of the city can be also considered from the special aspects of the urban structure. In the meantime, it is obvious that the extent of resistance of different urban structures and even the resistance of each of these elements in the different structures have considerable differences. Since we require a complete and comprehensive study to be able to discuss about the extent of effects which different urban structures are forced by the earthquake and its possible vulnerability, in this study we do not precisely investigate them. Anyway, it must be said that the different urban structures have different resistance against natural disasters and perhaps we could say that the multi-centered structure is more resistant to the natural disasters compared to the single-centered structure.

Urban Texture

Urban texture is considered as the form, size, and the combination of the smallest components of the urban structure; and in terms of type we can expect certain resistances from the urban texture against the natural disasters. This is because the urban texture influences how much and in which way the users use the city or regularity or irregularity of its form and size and the way of combination of the smallest components forming the city. Accordingly, the regular urban texture is more resistant that the irregular texture and moreover, the safety of the discrete texture against natural disasters is expected more than the contiguous texture. It should be noted that the reaction of any kind of urban texture when the occurrence of natural disasters directly influences the escape capabilities and refuging of residents and in serving and helping them by the relief forces or the way of cleaning and rebuilding and even their temporary housing.

The domain of these influences is not important only in designing the building, but also in urban design and crisis management it is considered widespread and significant. In evaluation and segmentation of the land, the geometric form of land plots (regular or irregular), the area size of the urban land plots and the aspects and the length and width proportions related to the land's use and the ownership type (private or shared) should be considered. The effects of these specifications directly influence the vulnerability coefficient or the effectiveness of texture due to influencing on the construction features and road network.

Moreover, the pattern of combination of open and close spaces and the proportion of the constructed surface to the open space are the most important criteria of effectiveness and measurement. On the other hand, the number of separated building units within each segment and the type of its closeness influence vulnerability due to the building destruction in open space.

In urban texture, we can refer to the fundamental role of road networks and the communicative arteries when the occurrence of natural disasters and earthquake besides the segmentation of lands and type and way of urban constructions in the scale of architectural principles and standards; they all are influential in the stage of reduction of the possible destructive effects of the earthquake and even in the process of crisis management cycle. In the secondary paths of the road pattern, its body characteristics are considered including length and width.

The road pattern is not considered as the vulnerability factor; but it should be noted that its body characteristics which are majorly the result of the adjacent patterns of road and building influence in the extent and the way of vulnerability of the communicative roads within the texture. The major part of urban texture especially in the residential sectors is the result of the adjacent characteristics of the textures components, that is to say the other indices of elements' combination and its components. The combination way and the regulation of segments are posed in formation of different textures and their vulnerability indices. Regular combination of segments in the same size and form will result in a regular texture that is followed by the reduction of the damage likelihood due to the steady transformation effect

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of the forces in adjacent buildings. Apart from the pattern of combination of segments in an urban texture, the adjacent pattern of constructions and open spaces of the adjacent segments is considered from the other indices of vulnerability.

The combination of roads and land segments and constructions in the land uses can be named from the other indices of vulnerability in the way that the way of adjacency of the separated segments with the adjacency passage of open and constructed spaces of each segment and the passage and the closeness degree of the roads should also be considered along with this feature.

We can name the pattern and size of the urban blocks and the pattern of roads and urban blocks combinations as the other indices and part measures of the texture capability which influence the extent of compression or regularity of its construction along with the segmentation system and secondary roads within the urban blocks.

Moreover, this point must be noted that the open space pattern in the total surface of the texture of the residential textures is considered as another factor in increasing its efficiency when the occurrence of natural disasters and the position and exposure surface of the open urban spaces adjacent to the buildings or natural terrains can cause the vulnerability of the open spaces regarded to its expanse.

Urban Densities

The two following principles can be mentioned about the urban density and urban vulnerability against the earthquake:

1. The less the population density is in the city, the city's vulnerability against earthquake decreases.
2. As the urban density is more balanced distributed in the city, its safety degree against the natural disasters especially earthquake increases.

In the contrary, it can be noted that the high population density in the city means more damages and losses when occurrence of the natural disasters and its causes are closing of the roads and streets and increasing the possibility of escape from the dangerous conditions and access to the safe areas and evacuation of injured people from the communicative roads.

Generally, the human densities have undeniable role in the different welfare, health and educational indices; but the relationship between the population density and the effects of the natural disasters is a bit more complex.

According to the deductive and reasoning method, it is clear that the population density has no role in the severity of damage, but the densities are important after the occurrence of the damage.

On the other hand, the physical location of the human densities is very significant. If the vulnerability domain of the city is different in various parts, in the resistant and safe parts of the city, the increase in densities are not threatened against natural disasters to the extent the capabilities respond to the vulnerability; because no serious danger threatens the human population before the occurrence of damage.

Urban Infrastructures

Damage to the infrastructures like water, electricity, gas and telecommunication networks can increase the losses caused by natural disasters and earthquake; for example, damage to the urban gas network and its relevant facilities can cause gas leaks and great fires as it occurred in Kobe, Japan in the natural disasters from the earthquake. The protection way of the urban gas tanks against the earthquake should be based on several principles:

1- Preventing from the secondary disasters (firing after the earthquake).
2- Locating and constructing tanks and connective facilities of urban gas in safe areas with the minimum possibility of human losses.
3- Capability of fast repairing the urban gas system

The urban gas tanks should be logically distributed throughout the city and be localized concentrated as more as possible. In the meantime, it seems necessary to consider vacant spaces far from the urban gas tanks for creating safe points throughout the city.

The urban gas equipment and facilities should be strengthened and consolidated using appropriate seismic codes and also a central control system should be considered for these facilities.

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Accordingly, all necessary equipment such as gas blockage switches, extinguishing foam, hydrant valves and other tools of fire extinguishment and assistance must be available. For the electrical equipment we must also carefully consider locating of the relevant facilities; it seems necessary to consider some storages as the emergency electricity for the time of occurrence of disaster and after its occurrence.

Urban Communicative Roads and Networks

The urban communicative network plays a fundamental role in reduction of the vulnerability of the city against earthquake and in case of the minimum damage of the network and the communicative roads, many losses are decreased when the occurrence of natural disasters like floods and earthquake.

Urban Land Use

Land use planning may play the basic role in reduction of the city's vulnerability against natural disasters (generally) and earthquake (especially) in the way that on case of observation of adjacencies in determination of urban uses and lack of exposure of heterogeneous and incompatible uses next to each other, the possibility of fast evacuation of the places is provided.

On the other hand, if the uses of urban structure are distributed in the way that they cause the lack of concentration in urban exertion points and internal sensitive areas, it can be expected that in addition to the reduction of city's vulnerability against natural disasters they can influence reconstruction after the disaster in the process of crisis management cycle.

In the meantime, many of urban lands uses play fundamental role in reduction of the vulnerability extent of the city and they are called the specific uses. These uses including schools, universities, hospitals, emergency centers, urban management centers and factories and fuel tanks are especially significant due to the possible risks for the neighbor areas and adjacent uses; also the emergency centers and hospitals are important and sensitive due to the key role in the treatment process and assistance and saving the injured and we must carefully consider the way of adjacency of the internal urban uses and also their locating and establishment.

In the meantime, the balanced and appropriate distribution and locating of some urban uses like emergency and crisis management centers and hospitals in the urban structure become so important that the location and communicative paths to these uses must be carefully considered because we cannot expect to be able to make optimized and efficient interventions about the crisis management and assistance and saving the injured people without sufficient attention and carefulness about locating and establishment of these uses in the city. Also in this respect it is necessary to reduce the city's vulnerability against natural disasters and earthquake as more as possible through allocating smooth and flat lands in direct and immediate connection with the roads network while the lack of adjacency with the vulnerable urban areas for appropriate transferring of the injured to these centers or lack of creation of traffic jams and masses in their adjacent points; consequently we can increase the safety degree of the city against natural disasters.

Also housing is from the most important urban uses and a huge prevent of the urban vulnerability against earthquake and natural disasters depends upon the type of urban housing constructions and observing the architectural design standards and the way of its constructions. Accordingly, the kind of the relevant subjects to the role of residential uses in reduction of the city's vulnerability against earthquake can be applicable in items such as the type of housing construction, the residential density, the hierarchy of adjacency with the neighbor uses and the existence or lack of the extinguishing tools and access supplements like escape stairs in the residential buildings and their details.

Moreover, the position of placing the residential complexes and their neighbor points also influence the reduction of vulnerability in the way that the house must be far from the risky uses like industrial workrooms.

Also simple plans should be used in constructing houses and the principle of lack of adjacency of the incompatible uses should be observed in locating and establishment of the residential complexes and their relevant uses. Using lightweight materials and making the possibility of fast evacuation of residential areas influence the reduction of the areas' vulnerability (NateqElahi, 1995).

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In fact, it can be noted that the residential areas are as the libraries under the influence of the process of severe ground tensions and the urban artificial environment vulnerability in two forms of (losses) and (damages).

Urban open spaces are considered as the other fundamental uses of the city which can act as support spaces in the process of crisis management and interventional measures after the disaster like assistance and saving and even temporary settling after the disaster. Accordingly, the quality and quantity of the urban open spaces and the way of their distribution throughout the city play basic role in reduction of the city's vulnerability against natural disasters.

This is because the open spaces can act as a place for settlement and temporary settling for collecting the injured people and public assistances; and as these spaces be in the more direct and closer relationship with the residential areas and their communicative paths be more accessible and easier to reach, they positively influence the increase the city's safety against the natural disasters.

Moreover, as the closeness degree of these spaces is lesser, the city's resistance against the natural disasters significantly increases.

On the other hand, the extent and way of the efficiency of the earthquake on the urban structure must be evaluated in terms of (losses) and (damages) and accordingly, the indices and items of the city's vulnerability against earthquake can be reviewed from these two fundamental aspects.

Among the influential factors on the above mentioned indices, the period of utilization of the use is more important so that for example the maximum percentage of the losses of the recent earthquake in Bam was for the residential areas and its cause appears when utilizing the land use and the occurrence of the earthquake. The utilization period of the urban land uses is also divided into three categories:

1. Continuous occupation: the use which has its users all hours of day and night such as residential use.
2. Active at night and day: the uses which are active at all hours of day and night but are not different at night and day in terms of the type of activity such as hospitals, military camps and police stations and so on.
3. Empty at night: the uses which are limited to the day like administrative, commerce and educational uses.

The most fundamental theory in planning to reduce the vulnerability of the land use is summarized in the principle of lack of development of distribution and expansion of lands exposing the risk of natural disasters; so we must prevent from the development and expansion of the lands locating in the risky areas and also adopt the desired uses in the other segments with the current risks and obstacles.

Urban Densities

As the density is lesser and is distributed throughout the city, the city's vulnerability against the natural disasters is lesser. On the contrary, high population density in the city means more losses and damages when the occurrence of natural disasters and in addition to killing more people due to the collapse of debris, this is because of closing of roads and streets and reduction of escape possibility from the dangerous positions and lack of access to the safe areas and also the difficulty in evacuation of injured people due to closing the communicative roads. Also the urban high densities mean the lack of empty space for temporary settling of the injured.

Generally, the human densities undoubtedly play role in different indices of welfare, health, education and access to services; but the relationship of population density with the effects of the natural disasters is a bit more complex.

According to the reasoning and deductive method, it is clear that the population density has no role in destruction severity, but the densities are significant after the occurrence of the destruction. In other words, since the time order of the effects of natural disasters is as follows, so the importance of the human densities is very considerable in the final stage.

On the other hand, the physical location of the human densities is very significant. If the vulnerability domain of the city is different in various parts, in the resistant and safe parts of the city, the increase in

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densities are not threatened against natural disasters to the extent the capabilities respond to the vulnerability; because no serious danger threatens the human population before the occurrence of damage. This is only true in the discussion of the human densities and infracting what was mentioned is not about the role of the city's vulnerability regarded to the locating of farness and closeness to the faults.

Urban Equipment and Infrastructures

Damage of the infrastructure facilities may increase the losses of the natural disasters in a city. Damage of the gas network can cause gas leakage in the space and create great fires which for example occurred in Kobe earthquake.

The protection of the urban gas tanks against the earthquake should be based on three principles:

1- Preventing from the secondary disasters (like firing after the natural disasters).

2- Locating and constructing tanks in safe areas

3- Capability of fast repairing the urban gas system

To avoid secondary disasters, the best task is to block all the tanks; but due to its effects of the people's living, an advanced system is required for doing such a work. In the field of affection of the urban gas system from the natural disasters, the important point is that whether the natural disaster influences the whole system to make the necessary plan about its influences.

The urban gas tanks must be normally distributed throughout the city. The urban gas equipment and facilities should be strengthened and consolidated using appropriate seismic codes and also have a central control system. If some part of urban gas system hurts, some gas leaks from it normally. Accordingly, all necessary equipment such as gas blockage switches, extinguishing foam, and hydrant valves must be sufficiently available throughout the city.

Urban Services

Unlike the definition of municipalities from the urban services, the urban services refer to a range of facilities which each of them meet a specific need of the citizens for desirable living in the artificial environment. The healthcare, safety and educational services, transportation, urbanism, green spaces and parks are just some part of this category of services. However some of these services like firefighting and emergency services have been basically created to react to the incidents, but the fact is that the crisis management has a close direct and indirect relationship with all urban services (Meader, 2006).

Conclusion and Summation

Regarded to the vulnerability and limitations of the natural locations for increasing the possibility of people's escape and settling (suitable building type, low building density, using roads as escape spaces and shelter), determining the body features (building type, body combination, segments and roads) and the functional features (the type of uses and population density) in each of the urban scales are considered as the methods of reducing the vulnerability. In fact, urban planning should localize the urban uses in the way that these uses firstly act as the earthquake-resistant residences, and secondly facilitate the necessary conditions for implementation of the crisis management plan as better as possible.

In fact, bad situation of establishment of body elements and inappropriate urban uses of the inefficient network of the city, compressed urban textures, urban high density, bad establishment of the urban infrastructural facilities and shortage and inappropriate distribution of urban open spaces and cases like these play the fundamental role in increasing the damages forces to the cities against earthquake. Elements like the city's structure, texture, form, urban densities, city's communicative networks and locating the urban elements are from the influential factors in vulnerability.

Form, size and the way of combination of the smallest components of the city determine the urban texture. Each type of the urban texture has a certain resistance when earthquake. In evaluation and segmentation of the lands, the geometric form of the segment, its size and dimensions, and the length and width proportions related to the land's use and the ownership type of the owner are measured.

The features of construction in each segment, the pattern of combination of open and close spaces and the proportion of the constructed surface to the open space are the most important criteria of effectiveness and measurement. Also the secondary roads network plays a significant role in the efficiency of the texture

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when the occurrence of natural disasters. In the secondary paths of the road pattern, its physical features including width and length are considered. In addition to the pattern of combination of segments in an urban texture, the adjacency pattern of the constructions and the open spaces of the adjacent segments are also from the other indices of evaluation of the urban texture's vulnerability and capability. From the other part indices we can name the capability of the pattern texture and the size of the urban blocks, the pattern of combination of roads and urban blocks, the way of adjacency of the separated segments with the passage, the adjacency of open and constructed spaces of each segment with the passage and the closeness degree of the roads. The open spaces pattern throughout the texture of the residential parts is another factor of increasing the texture's efficiency when the occurrence of natural disasters.

REFERENCES

Abdollahi M (2004). *Crisis Management in Urban Areas*, Municipality and Rural Administration Organization, (In Persian).

Ahmadi H (1997). *The Role of Urbanism in Reduction of City's Vulnerability*, Housing and Revolution, winter **2** (Tehran: In Persian)

Bahreyni SH (1996). *Planning of Land Use in Earthquake-Prone Areas with the Samples of Manjil City*, (Lowshan, Roudbar, Islamic Revolution Housing Foundation, Study Center of Iran's Natural Disasters).

BeygBabaei B (2007). *Urban GIS of the City and Electronic Citizen*, (North International University).

Habib F (2003). The Role of City's Form in Minimizing the Damages Caused by Earthquake, *Proceedings of the First International Conference of Natural Disasters in Urban Areas*, the first part (Earthquake), (Office of Studies and Planning of Tehran. In Persian)

Hamidi M (1995). The Role of Urban Design and Planning in Reduction of Risks and Crisis Management, *Proceedings of the International Conference on Seismology and Earthquake Engineering* **2.**

Hamidi M (2007). The Role of Urban Design and Planning in Reduction of Risks and Crisis Management.

Jalali AA (2001). Electronic City and Urban Management, Monthly Journal of Analysts of Information Era, *the First International Conference of Electronic City.*

Meader GJ (2006). Function of seismic zoning in the land use plan, *Zoning and Enforcement of Laws and Regulations of the Stanford Conference.*

NateqElahi F (1995). Vulnerability Functions of Tehran's Buildings, *Report of Seismology and Earthquake Engineering.*

Rajab Beygi M (2003). The use of re-engineering in administrative development, Management and Planning Organization, *Journal of Administrative development*, translated by the office of administrative development planning, **7** (38 and 39).

ShadiTalab Zh (1992). *Crisis Management*, Quarterly of Social Sciences, **1**(3 and 4), (Allameh Tabatabaei University Publications), winter

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