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ANALYZING THE ROLE OF CRISIS MANAGEMENT IN URBAN SUSTAINABLE DEVELOPMENT (CASE STUDY: AHVAZ URBAN FLOODWATERS)

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ABSTRACT

Considering that cities accommodate most population of the country to themselves, and are mostly the economic, political, cultural, social and governance centers in the countries, and since urban sustainable development refers to a balance between various social, environmental dimensions of the city and their concurrent development, so their preparedness against natural disasters should always be considered by the relevant experts. Over the past decades, new methods have been invented to confront the floodwater, and these methods have more preventive, and not a therapeutic nature. In this regard, the present research by documentary study has investigated the impact and role of natural disasters (urban floodwaters) crisis management on the sustainable development of Ahvaz city. According to the type of research, the proposed questions will be analyzed by two separate methods and will be answered. Therefore, separate questionnaires have been prepared for each one of the methods. The statistical sample to answer the first questionnaire has been estimated by the Cochran formula, that according to the population of Ahvaz city, 384 people were selected as the sample size and were questioned. The statistical sample of second group consists of 30 managers and authorities of Ahvaz city, was selected among the same first statistical population too. The obtained results of research findings indicate that there is a significant relationship between crisis management and sustainable development. As it is observed, the correlation coefficient ratio has been obtained as 0.829, its significance level has been 0.000, and since it is less than 0.05, it shows a significant correlation between variables.

Keywords: *Crisis Management, Sustainable Development, Urban Floodwater, Ahvaz City*

INTRODUCTION

Statement of Problem:

Natural disasters as natural phenomena have always existed and will exist throughout the life of the earth planet. The occurrence of natural disasters such as flood, earthquake, storm, and so on, in most cases has left destructive impacts on human settlements and has caused heavy casualties on their inhabitants, destroyed the buildings and infrastructure of these areas and imposed extended economic and social burdens on human societies and countries of the world. Natural disasters are considered as one of the main obstacles to sustainable development. Its occurrence is always a barrier to economic, social and civil development. If the severity of disasters is greater, national development plans will have more problems, because many civilizations and human societies have been destroyed due to the occurrence of natural disasters. By irrational utilization of natural resources management, human has increased the number and severity of disasters. Due to the expansion of large cities, the floodwater

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phenomenon has found a new image and has opened a new position in urban studies under the name of urban floodwater (Ghohroodi, 2009, 1).

One of the cities of Iran, facing the risk of urban floodwaters crisis occurrence more than other cities, is Ahvaz city. This city has been expanded at an altitude of 18 meters above the sea level on the sides of the Karun River. As the city is located in flat areas of the river whose height to the standard water level of the river is less than 5 meters, in the rainy season of the year, the residential lands and adjacent establishments of the river have been flooded by flood of water and its overflowing that cause a lot of financial and life losses. The Karun floods in 1992 and 1998 killed 376 and 11 people respectively. The rainfall season of Ahvaz city usually starts from November each year and lasts until May of the following year. The created floodwaters in the early part of the rainy season are caused by heavy rainfalls or long time rainfall, and usually the maximum discharge of these floodwaters is very great and the duration of floodwater is short and with low floodwater volume. The floodwaters of the end of the season have spring rainfalls and melting snow at the same time (Ghorbanian et al., 2012, 2).

Accordingly, one of the most important aspects of the crisis management performance is to investigate its positive or negative effects on sustainable development. For this reason, the role of crisis management during the occurrence of natural disasters, especially urban floodwaters, should be taken into consideration by planners and urban planners.

Considering the stated points, the main issue of the present research is: How is the impact of crisis management at the time of natural disasters (floodwater) occurrence on sustainable development in Ahvaz city?

Research Necessity:

Nowadays, considering the specific changes that have been taken place in the structure and organization of cities, they have highly been put at risk against unexpected incidents. Many scientists have proposed the point that the world has become more risky than before and earlier (Bick, 2009). We live in a world that the dangers we create are as much as or more than what we are imposed from the outside world.

As the city of Ahvaz is located on both sides of the Karun River and due to the extension of urbanization in a way that during the rainfall season of the year, the residential and agricultural lands, urban establishments, Medical Sciences University, the great Golestan hospital, banks, roadways and so on are located adjacent to the river, at the time of river flood have been flooded, that cause life and financial damages. Social participation of people and NGOs, more attention to floodwater management crisis as one of the environmental sustainable sources, recognizing the weaknesses and strengths of organizations and executive agencies in the city of Ahvaz by the management crisis of urban floodwaters, applying the principles and criteria of urbanization, urban texture and structure, communication networks and urban infrastructures can highly reduce the effects and losses caused by incidents.

The geographical location of the cities of Iran indicates that with regard to the location of cities in the course of various watersheds, it is felt essential to make necessary predictions for floodwaters, and city makers and urban planners, geologists and geographers should investigate exactly the causes and factors of creating these natural disasters in urban areas and anticipate the necessary solutions to reduce its effects (Tehran Office of Urban Studies and Planning, 1992, 401).

Research Question:

The present research seeks to investigate the role of crisis management in urban sustainable development (case study: Ahvaz urban floodwaters), and the research question is as follows:

- How is the impact of crisis management on sustainable development of Ahvaz city?

Research Hypothesis:

According to the research objectives and with regard to the literature and its theoretical framework, the hypothesis of this research is proposed as:

- There seems to be a significant relationship between crisis management and sustainable development of Ahvaz city.

Research Method

In the present research, descriptive-analytical and survey method has been used to answer the questions and the desired goals of research. The data collection method has also been a questionnaire. The statistical population of present research consisted of citizens residing in Ahvaz city and the professionals and experts of organizations related to the crisis management. Considering that the questionnaires of this research should be answered by two groups of citizens and experts, we had two types of sampling method; the first method was simple random sampling method that will be the citizens of Ahvaz city and in the second method, sampling method has been performed based on non-probable sampling and as judgmental or deliberate method; in the second population (professionals and experts), choosing samples has been done based on the academic activities and educational degrees of individuals. According to the statistical population, the statistical sample to answer the first questionnaire has been estimated by the Cochran formula, that with regard to the population of Ahvaz city, 384 people have been selected as the sample size and have been questioned. The statistical sample of second group is also 30 managers and authorities of Ahvaz city selected from the same statistical population.

Research History:

Research History in Iran:

Ghanavati et al. (2009), in a research entitled as "Empowerment of Urban Crisis Management in order to Reduce the Natural Disasters (Earthquake); Case Study: Khorramabad City", have concluded that reducing the effects and damages, due to the natural incidents in particular, can be achieved through applying proper management.

Azizpour et al. (2010), in a research entitled as "Prioritizing the Factors Affecting Urban Crisis Management against Natural Disasters; Case Study: Organizations Related to Isfahan City Crisis" have investigated 34 variables in 6 main factors in 20 organizations related to the natural disasters crisis in the city by using the factor analysis in order to prioritize effective factors in crisis management in Isfahan city. The obtained result of investigation shows that the first factor is the existence of a storage system for rescue and relief support management, which includes 7 variables.

Amir Ahmadi et al. (2011) have conducted a research entitled as "The Micro-Zoning of Floodwater Risk in the Area of Sabzevar City, in Line with Urban Sustainable Development", with the aim of investigating the vulnerability of floodwater and assessing the damages imposed on the city of Sabzevar; by a damages assessment map, it was cleared that the specified areas correspond to various zones in respect of flood-prone intensity by 80 percent.

Gandomkar (2012), in a research entitled as "Flood Occurrence Crisis Management in Isfahan City by Using Atmospheric Systems", concluded that the main factor of the incidence of severe and flooding rainfalls in Isfahan city is the entry of the Sudanese low pressure system from the southwest of the country to this region.

Also, in an article entitled as "Application of the Integrated Urban Floodwater Model in Megacities (Case Study: Northeast of Tehran)" that has been published by Manijeh Ghohroodi, she has concluded that urban data integration can be a strategy for floodwater management in megacities including Tehran.

Mashhour, Zeinab (2012) in an article entitled as "The Role of Identifying Components in the Physical Stability of the River Banks (Case Study: Evaluating the Role of Karun and Zayandehrud Rivers in Identifying the Cities of Ahvaz and Isfahan)", by recognizing and explaining the physical, functional and ecological identifying components of the natural structure of the city on the macro and middle scales as an important factor in the social sustainability of public spaces, has recognized and evaluated the role of Karun River on the local identity of Ahvaz city in the framework of city's natural structure management strategy and has comparatively compared it with Zayandehrud River in Isfahan, and has analyzed the opportunities and threats of this issue. In performing this research, qualitative evaluation method as descriptive-analytical-comparative and the case study strategy has been used. The obtained results of this research showed that Ahvaz city requires attention of upstream projects to the role of river in the framework and physical structure of the city.

Hosseini et al. (2013), in an article entitled as "Strategic Plans of Urban Floodwaters Management with Sustainable Development Approach", believes that special attention to the issue of floodwater crisis management in interaction with other fundamental and applied sciences and knowledge is inevitable.

Bostani, Maryam et al. (2013), in an article entitled as "The Importance of the Environmental Study of Rivers Landscape inside the City; Case Study: Rivers of Karun, Ahvaz, Khuzestan", by investigating the existing shortages in the Karun River basin according to the present status, and referring to the potential of Karun River and the importance of people's willingness to be alongside the river to spend their leisure time, emphasize on the elimination of environmental pollutions and changing useless spaces next to the river and changing the visually unqualified spaces to safe, active and attracting population spaces.

Kohvazi, Sadegh, et al. (2013), in his article entitled as "Revitalizing the River Bank through Designing Eco-Parks Alongside the River; Case Study: Karun River", with a descriptive-analytical approach investigated present status of Karun bank revolving around one of the historical bank spaces and by comparing it with the present time, investigated the impact of building banks and eco-parks alongside the river on the sustainable development of the bioclimatic of cities and improving the quality of life (in the context of designing sustainable landscape), in which they have firstly introduced a sample of the traditional and historic gardens of the Karun River bank, called Bagh Khan, and afterwards the found results (contemporary sustainable design elements being synonymous with traditional landscape design and Iranian gardens) are used for the proposal process on the Karun bank, which have been presented as solutions, strategies, and micro-plans, and short, medium, and long-term action plans.

Research History outside Iran:

J. W. Hansen et al. (2008) in a study entitled as "Risk Management and Climatic Changes" investigated the effects and results of crisis management in reducing the damages caused by climatic changes on the agriculture and livelihood of villagers.

Javanbarg et al., (2009) investigated the multi-hazard analysis of lifeline network at the University of Tokyo. In this analysis, the lifeline network has been considered as nodes and links, and failure in each of them and its simultaneous impact on other link and nodes are considered and ultimately, the failure risk is obtained. The main limitation of this model is that, it has efficiency in lifelines that are in the form of link and node (Javanbarg et al., 2009).

Schmidt et al. (2012) addressed the modeling of multiple disasters risk, including earthquake, volcano, flood, wind, and tsunami, and developed a software called RiskScape that can obtain multiple hazards risk. Of course, this software has been written in JAVA language and has some limitations too. In this research, the hazard consequences have not been considered and are determined independently.

Xing et al., (2008) investigated and determined the multiple hazards risk with respect to probabilities, and have ultimately obtained hazards risk (asset and lifelines network) quantitatively. In this research, defeat has been considered in systems such as lifelines, which are in the form of link and node.

Henstra and McBean (2005) in their article state that Canadians face with a wide range of natural hazards such as flood, storm and so forth. In some cases, these hazards are interacting with the vulnerability that will be followed by major disasters. The major disasters have the potential to impose significant social and economic costs. In this research, it is argued that, despite the brilliant successes of the past, the Canadian Political Advocacy Society has not been able to fully reduce the effects of disasters through disaster management yet and, therefore, in order to move from an antecedent-inclined and primitive system towards a reaction and improvement system-returning to the initial condition- a larger political commitment will be needed.

Salvi (2007) writes in his article: Disasters Management Services should respond to 10 goals, including: increasing people's participation to maintain their safety, prioritizing the elimination of the needs of disadvantaged groups, organizing at the local level but coordinating by higher levels of government, compatibility with ecological sustainability and regional and urban planning dependent on the local area. This article reviews the contemporary process of crisis management in the incident, and proposed the recent history of emergency preparedness in terms of the fundamental superiority between passive defense and civil protection. It also reviews a number of aspects of Katrina's Storm Management in New Orleans in August and September 2005. In Iran, since the early 1940s, with the occurrence of Buin Zahra earthquake, researches and programs in relation with dealing with natural hazards have been started.

The distinction aspect of this research with the mentioned studies and researches is related to the flood-prone of the Karun area in Ahvaz city, in which the flooding situation was investigated first; then, studying the problems and providing solutions by using relevant statistics and related evaluation models have been done; these actions, from the Spatial domain viewpoint and research methods are different from the works conducted in the background.

THEORETICAL FOUNDATIONS:

Definitions:

Crisis Management: It is a set of executive activities and managerial and political decision makings depending on various stages and all levels of the crisis, in order to rescue, reduce losses and damages, prevent life, production and services interruption, and maintain communication, preserve the environment, and finally restore and reconstruct the devastations (Foster, 1980, 1).

Sustainable Development: The most well-known definition about sustainable development has been presented in the report: "Our Common Future", which considers sustainable development as the development that removes the current needs without exploiting the ability of future generations to meet their requirements (Siwar et al, 2009, 310).

Natural Hazards: Any unexpected event that provides the causes the weakening and eliminating economic, social and physical capabilities, such as life and financial losses, the destruction of infrastructure establishments and the reduction of employment areas in the community are introduced as natural disasters (Hasani, 2005, 75). Earthquake, flood, drought, natural pests, volcano, forest fires and atmospheric phenomena can be named as the significant examples of this issue.

Urban Flooding: A flood or floodwater is a level or abundant (abnormal) water flow on the surface of the earth, within a river, in a flood path, on a lake or in a coastal area that results in significant impact. Urban floodwater is a volume of water that is more than the drainage capacity of the city and results in the emergence of a series of problems and damages in the city.

Urban Vulnerability Theory:

If we consider the vulnerability as a degree or level that a system is susceptible to damage due to the imposed pressures, according to the prevailing view in the human sciences, this degree is specifically determined in relation with two factors:

1. Systems of dealing with crisis, pressure and threat;
2. The inability of system to overcome the crisis.

According to the vulnerability theory and its conceptual features, there is a certain amount of vulnerability in any supposed urban space, but the levels and extent of vulnerability and safety in the city area have not been distributed equally; because infected, defenseless, and vulnerable spaces are the occurrence location of any types of violence, crimes and even environmental hazards, while in other places there is no urban insecurity pattern and, consequently, there is no vulnerability or less vulnerability occurs (Mohammadi Dehcheshmeh, 2013).

According to the vulnerability theory, the probability of incidents and hazards occurrence for a group of citizens in certain parts of the city is always higher than others. These people are called incidental, defenseless, susceptible to incident or vulnerable and at risk members. In the social and economic dimensions and macro analyses of the vulnerability theory, more general definitions have been expressed. In many cases, the qualitative ranking of vulnerability is classified by "high", "moderate" and "low" criteria.

In a behavioral view, Da'īnejhān divided urban environment damages into two categories:

1. Structural damages: including the destruction of buildings, installations and infrastructures with varying degrees;

2. Non-structural damages: including human, environmental and health damages.

In terms of temporal occurrence and the extent of destruction, urban environment damages can be divided into two categories:

A. Primary Damages: Damages that immediately and due to the lack of direct action of the imposed forces on the surface and volume, occur. For example, various types of structural damages can be mentioned.
B. Secondary Damages: This type of damages involves exacerbating and expanding the range of primary damages (synergy of damage) and generally occurs due to the effects of environmental factors function. For example the spread of fire, explosion and social-psychological problems can be mentioned.

Apart from the positive causes of damages in different time and place frame, the concept of vulnerability is often mixed with risk. If we consider risk as a degree of potential damage which is a result of the probability of hazards occurrence and a level of vulnerability, vulnerability can be known as an inherent defect in the particular dimensions of the city environment, which, due to its biological, physical or designing characteristics is susceptible to damage (Amini Varmaki et al., 2014: 12).

Factors Affecting the Vulnerability of Cities

The vulnerability due to natural effects and factors (Tectonics: active fault, volcano, avalanche, tsunami, storm, and so on.)

- Vulnerability due to the man-made factors (urbanization)
- Increasing density in vulnerable areas

A. Population Density: Population density will be followed by high construction density and the shortage of open spaces during the overcrowding time, disturbance of relief conditions and so forth. Also, population density in the city means more damages at the time of crisis occurrence, closing the pass ways and reducing the possibility of escaping from dangerous situations and access to safe areas, as well as the difficulty of saving the injured people due to the blocked communication routes.
B. Lack of Sufficient Open Spaces in High-Risk Areas: Open space is used as a balancing and generalizing space in urban space, which is a complementary to the green space. At the same time, open space as a justifier of building and human density, has appreciable significance. The common aspect of open space, as a space connecting various activities that appears in the form of a particular skeleton within the city and specifies a part of urban structure or form. In this way, the appropriate design of open spaces within urban textures is considered as one of the most important tools for dealing with the risk. The usefulness of open spaces in urban areas depends on the amount and ratio of these spaces, the equal distribution throughout the urban area, as well as the continuity of green areas. In general, it can be stated that the as the dispersion of open spaces and their distribution throughout the city is more appropriate, dealing with crisis will be performed better (Amini Varmaki et al., 2014: 12).

Natural Disasters Management Approach

Natural disasters management texts posed two approaches of Standard Policies (up to down) and society-based approach (down to up) for implementing comprehensive management,

especially in the pre-disaster stage; these two approaches somehow show the differences of native and new methods, too, including:

Standard Policies Approach (Top to Bottom)

In this approach, many of the performed activities are merely technology-driven and based on the "command and control" model. This approach gives special importance to the formulation of strategies and instructions, and calls for standard solutions and has a commanding and "top-bottom" mode. This approach requires the development of tools to reduce overall risk. In this approach, the development of methods and criteria is for contributing preventive (from the occurrence of disasters) activities such as planning guidelines and regulations, building standards for earthquake reduction, control and regulation, registration and anticipation of accidental occurrences, initial risks announcement, decision-making facilitating tools, awareness and education programs, and so on for initial effective decision-makings.

Local Community-Based Approach

In the community-based approach, this belief that the responsibility of helping communities suffered by incidents, based on the top-bottom approach, is generally the responsibility of external assistances and government forces, is fundamentally changed and the approach does not accept it. The community-based approach states that the affected local population should be regarded as individuals with action and participation ability, and not as disabled people who should be helped, and wants to strengthen local capacity through the participation of all individuals and groups such as community-based organizations, nongovernmental organizations (NGOs), specific groups within the community, and local government representatives at national level. This approach states that it is the responsibility of communities and local government to prepare initial plan in reconstruction management, setting up and implementing objectives and plans, resources distribution and selecting priorities in any disaster. The role of central and state governments has been summarized in budget preparation, financial resources, and providing suggestions and consultations (Eftekhari et al., 2009, 7, and 8).

RESEARCH FINDINGS:

Among the respondents, 67.7 percent equal to 260 people were men and 32.3 percent equal to 124 people were women, 16.9 percent (65 people) were single and 83.1 percent (319 people) were married.

In investigating the citizens' age classification, it was indicated that 33.9 percent (130 people) are placed in the age range of 20-30 years, 39.6 percent (152 people) are in the age range of 30-40 years, and 26.6 percent (102 people) are in the age range of 40-60 years.

Also, by investigating the education level of citizens in Ahvaz city, it was specified that 4.2 percent (16 people) have diploma degree, 15.6 percent (60 people) have associate degree, 33.6 percent (129 people) have bachelor degree, and 28.1 percent (108 people) have master degree and 18.5 percent (71 people) also have Ph.D. degree.

83.6 percent of interviewees were residents of Ahvaz city, 12.5 percent of people were in the city because of the employment, and also 3.9 percent was because of education.

Investigating Sustainable Development Indicators Impacting on Crisis Management in Ahvaz City:

In this section, to investigate the crisis management performance in Ahvaz city, especially at the time of the incident (urban floodwaters occurrence), the relevant experts were asked about how to manage the city during the crisis time, organizing the injured people, the preparedness of rescue forces at the time of crisis occurrence, helping injured people and so on, that in this way, the crisis management performance in Ahvaz city, especially at the time of natural incidents occurrence time such as urban floodwaters, has been investigated.

- ❖ How much attention has been paid to the safety of buildings in Ahvaz city?

Investigations show that in response to the question of securing buildings in Ahvaz city, experts believe that 23.3 percent of buildings have been secured very low, 60 percent of buildings have been secured low and 16.7 percent of buildings have somehow been secured. Therefore, it can be concluded that securing the buildings in the city of Ahvaz has not been performed to deal with natural and human crises.

- ❖ How Crisis Management is prepared to Deal with Crisis in Respect of Infrastructure?

In response to the question of the role of crisis management to deal with the crisis in terms of infrastructure, the results show that 30 percent of the experts have chosen very low option, 26.7 percent have chosen the low option, 23.3 percent have chosen the somehow option, and 20 percent have chosen the high option.

- ❖ How much helicopter is used in Ahvaz city in order to deploy at the time of crisis?

The results show that the selection of appropriate and optimal location in Ahvaz city for helicopter deployment at the time of crisis is taken 40 percent as very little, the selection of optimal location for helicopter deployment is taken 43.3 percent as not good, and the selection of optimal location for helicopter deployment is taken 16.7 percent as somehow appropriate. Therefore, it can be concluded that in Ahvaz city, the optimal and appropriate location for the helicopter deployment at the time of crisis has not been adopted.

- How many sport halls of Ahvaz city are used as emergency places for organizing people?

Investigations show that for using the sport halls in Ahvaz city as emergency places for organizing citizens, 33.3 percent of the experts selected very low option, 40 percent of the experts selected the low option, 23.3 percent of the experts selected the somehow option, and 3.3 percent of the experts selected the high option. Therefore, it can be concluded that sport halls in Ahvaz city are not used appropriately as emergency places for organizing citizens.

- To what extent is crisis management effective in reducing vulnerability?

Investigations resulted from the experts' response to the question of the role of crisis management in reducing vulnerability show that 6.7 percent of experts have chosen the very low option, 13.3 percent of the experts have chosen the low option, 40 percent of the experts have chosen the somehow option, 26.7 percent of the experts have chosen the high option, and 13.3 percent of the experts have chosen the very high option. Therefore, it can be concluded that experts in Ahvaz city, despite the public attention to the issue of crisis management and its role in reducing the ratio of casualties at the time of crisis occurrence, are still not aware of it, in a way that 60 percent of relevant experts in the field of crisis management in Ahvaz city believe that crisis management have a very low to somehow role in reducing vulnerability

ratio. As a result, necessary trainings should be provided for the experts in the field of crisis management in the city of Ahvaz.

- To what extent is the crisis management effective to facilitate gathering, rehabilitating and reconstructing forces?

The results in answering to the above question indicate that up to 50 percent of the crisis management does not affect rehabilitating and reconstructing forces. Also, 16.7 percent of the experts consider its impact very low, 26.7 percent of them have considered the impact of crisis management as somehow. It should be mentioned that only 6.7 percent of the experts have considered the impact of crisis management as high.

- How much attention has been paid in the city of Ahvaz to create safe structures and fortifications on the banks of Karun River?

Investigations show that 53.3 percent of the experts believe that little attention has been paid to create safe structures and fortifications on the banks of Karun River. Also, 26.7 percent of the experts believe that very little attention has been paid, and also 20 percent have chosen the somehow option. As a result, it can be said that no attention has been paid to create safe structures and fortifications on the banks of Karun River in Ahvaz city.

- To what extent does crisis management accelerate helping flooded people at the time of flood occurrence?

23.3 percent of the experts have chosen very low option, 23.3 percent of the experts have chosen the low option, and 40 percent of the experts have chosen the somehow option in order to answer the abovementioned question. The results also show that only 13.3 percent of them have chosen high and very high options.

- To what extent does the use of crisis management accelerate the pre-crisis preparedness stage?

The results show that 56.7 percent of the experts believe that using crisis management does not accelerate pre-crisis preparedness stage; 10 percent believe that crisis management somehow accelerates pre-crisis preparedness stage, and 33.3 percent have also said that crisis management accelerates the pre-crisis preparedness stage as very high and high.

- To what extent does the crisis management reduce damages and losses caused by flood risks?

The obtained results of the investigations show that 13.3 percent of the experts believe that applying crisis management reduces damages and losses caused by flood risks in a very low amount, 20 percent of the experts believe that applying crisis management reduces damages and losses caused by flood risks a little, 36.7 percent of the experts believe that applying crisis management somehow reduces damages and losses caused by flood risks. Also, 23.3 percent of the experts believe that applying crisis management highly reduces damages and losses caused by flood risks, and 6.7 percent of the experts believe that applying crisis management very highly reduces damages and losses caused by flood risks very highly.

- To what extent does the crisis management is a solution to reduce vulnerability?

Investigations indicate that crisis management at a ratio of 3.3 percent is a very good solution to reduce the vulnerability against flood, while it is at a ratio of 10 percent a good solution. Also, 36.7 percent consider crisis management to be somehow appropriate, 36.7 percent

consider it as low and also 13.3 percent believe that crisis management is not a good solution to reduce the vulnerability against flood.

- To what extent does the crisis management help authorities to reduce the life and financial costs?

Investigations indicate that crisis management up to 16.7 percent helps the authorities very little to reduce the life and financial costs. It also helps the authorities a little to reduce the life and financial costs at a ratio of 30 percent, somehow at a ratio of 33.3 percent, very high at a ratio of 6.7 percent, and high at a ratio of 13.3 percent.

- To what extent does crisis management prevent risks?

Investigations indicate that 46.6 percent of the experts believe that crisis management does not prevent risks, and so they have chosen very low and low options, 30 percent also believe that crisis management somehow prevents risks. Also, 13.3 percent believe the impact of crisis management to prevent risks as high, and 10 percent of experts believe its impact to prevent risks as very high.

Ahvaz Crisis Management Performance at the Time of Urban Floodwaters Occurrence

The obtained results of investigating the crisis management performance in Ahvaz city at the time of urban floodwaters occurrence show that 63.3 percent of the experts are not satisfied with the crisis management performance in this city and described the crisis management performance as bad. Also, 33.3 percent believe that the crisis management performance in Ahvaz is moderate. Only 3.3 percent believed that crisis management in Ahvaz city has had a good performance. As a result, it can be concluded that the crisis management performance in the city of Ahvaz has not been good; consequently, it resulted in the citizens' dissatisfaction with Ahvaz city crisis management. Therefore, serious decisions should be taken in the field of Ahvaz city crisis management, so that at the time of the occurrence of natural incidents and risks, they do not increase human and life casualties of citizens.

• Investigating Four Stages of Crisis Management (Prevention, Preparedness, Confrontation and Reconstruction)

The investigations obtained from the stages (prevention, preparedness, confrontation and reconstruction) of crisis management in Ahvaz city indicate that in this city, the preparedness stage with an overall mean of 2.05 is in better condition than the other stages of crisis management. Therefore, it can be said that the preparedness stage in Ahvaz city is in a more appropriate situation than other crisis management stages, but the preparedness at the time of the incidents occurrence to prevent the increase of damages due to natural hazards to the citizens is not in an appropriate situation. Also, the prevention stage after the preparation stage with the overall mean of 2.04 has been located in the second position.

The results obtained from investigations show that the reconstruction stage, which begins after natural and human incidents occurrence, is in the worst situation, in a way that the overall mean of reconstruction stage has been obtained 1.96. Therefore, it can be concluded that generally, crisis management in Ahvaz city does not have appropriate performance at the time of natural hazards occurrence, especially at the time of urban floodwaters occurrence. The mean and prioritization of crisis management stages have been specified below.

Table 1: Comparative Comparison of Crisis Management Stages in Ahvaz City

Crisis Management Stages	Mean	Prioritization
Prevention	2.04	2
Preparedness	2.05	1
Confrontation	2.02	3
Reconstruction	1.96	4

- *Correlation Coefficient*

The results obtained from the correlation between crisis management and sustainable development indicates that there is a significant relationship between crisis management and sustainable development. As it is observed, the correlation coefficient ratio has been obtained 0.829 and its significance level has been 0.000; as it is less than 0.05, so it shows a significant correlation between variables. In the table below the correlation between sustainable development and crisis management in Ahvaz city has been specified.

Table 2: Correlation Coefficient between Crisis Management and Sustainable Development in Ahvaz City

		Crisis Management
Sustainable Development	Correlation Coefficient	0.829**
	Significance Level	0.000
	Number	30

Source: Research Findings

- *Regression Analysis*

Stepwise Method: Step-by-Step (Combination of Forward and Backward)

This means that both the Forward Method and the Backward Method are performed with each other; in a way that at first between the individual independent variables on the one hand and the dependent variable on the other hand, the correlation coefficient is calculated. The highest correlation coefficient is the candidate to enter the equation. Then, the significance level of that candidate correlation coefficient is investigated; if it is below 0.05, it enters to the equation. In the second stage, the correlation coefficient is calculated between the individual independent variables outside the equation on the one hand and the dependent variable on the other (and by controlling the effect of variable that has been entered to the equation in the first stage). The highest value of the correlation coefficient becomes the candidate to enter into the equation. If the significance level of this correlation coefficient is less than 0.05, the corresponding variable is entered. So far, it is performed according to the Forward Method. Before repeating the third stage, like the second stage, for the other variables outside the equation, the entry of the second variable into the equation may lead to the insignificance of the variable entered into the equation in the first stage. If this is the case, based on the Backward Method, the variable entered in the first step is thrown out and if this is not the case, the third stage continues according to the Forward Method. These two methods continue concurrently until it does not find any variable outside the equation based on the significant level of 0.05, the condition for entering the equation, also no variable entered to the equation based on the significance level of 0.10 does not find the condition for removing from the equation; therefore, the Stepwise Method is a more appropriate method which is used often, unless in this strict method, the

number of obtained variables is very low and we want to have a number of, even weak, variables in the equation, that in this case the Backward Method will be used.
As it is observed in the table below, the entered variables of crisis management are (prevention, preparedness, confrontation and reconstruction stages), but we do not have a removed variable. In the method section, the Stepwise Method is written and in brackets (the probability criteria of the F test to enter: smaller than or equal to 0.05, and the probability of the F test to remove: greater than or equal to 0.10) is written.

Table 3: Variables Entered or Removed From the Equation

Model	Variables Entered	Variables Removed	Method
1	Crisis Management	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: Sustainable Development

CONCLUSION:

The results obtained from investigating crisis management in Ahvaz city at the time of urban floodwaters occurrence show that 63.3 percent of the experts are not satisfied with the crisis management performance in this city and described the crisis management performance as bad. As a result, it can be concluded that the crisis management performance in the city of Ahvaz has not been good, the point that is followed by the citizens' dissatisfaction with Ahvaz city crisis management. Therefore, serious measurements should be taken in the field of crisis management in Ahvaz city, so that at the time of the occurrence of natural incidents and hazards, does not cause increase in human losses.
Regarding the investigation of the role of four stages of crisis management, it was specified that in the prevention stage, crisis management in Ahvaz city, in the field of preparation and compilation of required instructions for maintenance of establishments and reducing natural disasters, has acted at a ratio of 10.2 percent as very poor, 58.1 percent as poor, 27.9 percent as moderate, and only 3.9 percent as good. As a result, it can be said that crisis management in the city of Ahvaz in the field of preparation and compilation of required instructions for maintenance of establishments and reducing natural disasters has poor and very poor performance.
Also, regarding planning and ensuring the collection of climatic information, investigations show that crisis management in Ahvaz city has acted 18.5 percent as very poor, 44.8 percent as poor, 30.5 percent as moderate and only 6.3 percent as good. As a result, it can be said that crisis management in Ahvaz city has had poor performance in terms of planning and ensuring the collection of climatic information.
The obtained results of research findings show that there is a significant relationship between crisis management and sustainable development. As it is observed, the correlation coefficient ratio has been obtained as 0.89 and since the significance level is less than 0.05, so it shows a significant correlation between variables.

SUGGESTIONS:

- In relation to the urban structure of Ahvaz, if there is a need to construct sensitive and strategic urban elements along the margin of Karun River, their high degree of stability during construction should be considered.
- Considering the problem of shortage of parking spaces and vehicle congestion, the construction of suitable parking along the margin of Karun River for new constructions should be considered.
- In order to act quickly in the crisis times, regarding the role and function of the coastal zone of Karun River, which is due to its potentials, the division of duties should be performed.
- Creation of inappropriate land uses along the margin of river should be prevented.
- The concepts of passive defense and crisis management should be institutionalized in the minds of community. It should also be tried to prevent the occurrence of events and, at the time of the occurrence, damage should also be prevented; in case of imposed damage, it should be minimized, because the promotion of this type of viewpoint and training is carried out only through creating culture.
- The creation of floodgate walls; because one of the structural methods is the construction of protective walls in areas that suffer from a lot of damages during the floodwater. Since no change can be created in the atmospheric elements and factors in order to prevent the harmful social and economic effects of flood; hence to reduce these sustained impacts, one of the floodwater control methods that should be used is the coastal wall construction method.
- Ownership of assets and clearing the margin areas of the river should be done as there is a probability of flooding them.
- Continuous visits of protective organizations of Rivers and Ahvaz Municipality from Karun River and the identification of vulnerable areas and efforts to tackle the existing problems should be put.
- Preventive and protective operations in flood-prone areas should be done such as (discharging places during flood occurrence, rapid rescue assistance to the flooded people, and floodwater discharge of inside of the buildings, compatibility with floodwaters, and increasing awareness and public training)
- installing flood warning systems in high risk areas

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