2.9 Disaster Risk Management Strategy for Cultural Heritages of Iran-Case Study: Qaisarieh Bazar of Lar-Iran

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1. Introduction

Cultural heritages like other kinds of structures are at risk of natural and man-made hazards. In many countries, there is not any plan to protect them against high risks of disasters due to negligence, insufficient budget or lack of technical knowledge. In order to reduce the risks of disasters on the cultural heritages, it is required to follow a verified frame work in planning process. The mentioned plan should address all aspects of any cultural heritage impacted by disasters. The methodology introduced by International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM) is recommended for this purpose due to following reasons;

I. It is technically simple and easy to use;

II. It is comprehensive that covers all aspects of a cultural heritage including tangible and intangible attributes;

III. It is universally verified and could be applied to all types of cultural heritages.

In this paper, the so called ICCROM methodology would be applied to a case study chosen from Iran.

A brief look to the situation of cultural heritages in relation to Disasters in Iran

Iran is amongst 10 countries with the most exposure to natural hazards in accordance with the report of United Nations Organization. Arg-e-Bam which was a unique cultural heritage; totally collapsed due to happening of great Bam Earthquake of 2003, Bam, Kerman province. Arg-e-Bam was asfamous as the largest structure in the world made out of masonry and dated back to 5 centuries B.C.

Fig.1 Arg-e-Bam before earthquake

Fig.2 Arg-e-Bam after happening of earthquake

Fig.3 Arg-e-Bam nowadays after reconstruction

Other than Arg-e-Bam, there are numerous archeological sites all over parts of Iran which are exposed to various hazards and are unprotected against them. The common characteristic of them is that they are all built based on old building technologies and made out of conventional construction material. Beside corrosion due to exposure to harsh environmental conditions, intensified risk of natural and man-made hazards is considered as a sever threat to the health of cultural heritages. However, policy makers and stakeholder organizations seldom take serious actions into consideration for protection of the cultural heritages. The most prominent reason for this negligence seems to be due to lack of budget. Hence, the consideration of historical heritages is placed amongst the lowest priority measures comparing with supplying welfare of people.

2. Objectives and Methodology

The main objective of this article is to introduce an outline for disaster risk reduction of cultural heritage sites based on the methodology introduced by ICCROM. In order to display the applicability of the method, a case study has been employed to implement the methodology. The applied methodology is described in the following in brief;

• The work flow of the study follows the steps which are displayed in Fig. 4;

• The way it looks to the cultural heritage follows the path from regional level, site level, building level then attributes;

• The use of pressure matrix would result in contribution of different stakeholders;

• The qualitative risk assessment method would be used to prioritize the risks relevant to different attributes of cultural heritage;

• Scenario building describes the way a certain risk influences the specific attributes of the cultural heritage;

• Eventually, structural and non-structural solutions would be design to address certain attributes of the cultural heritage in order to lower the incurred risk.

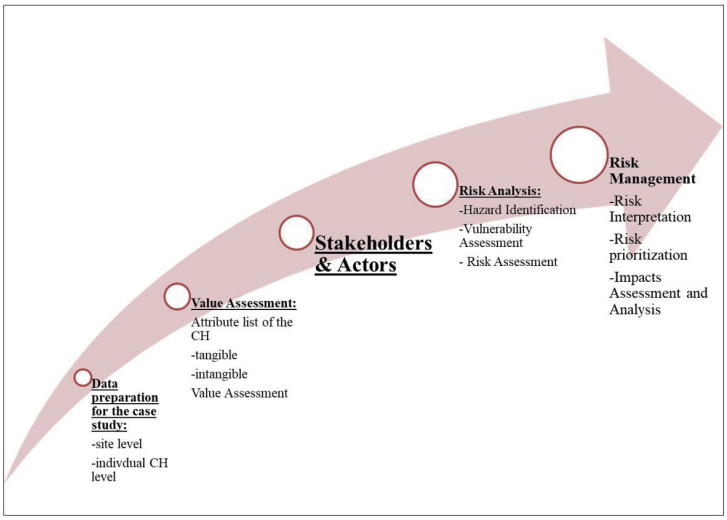

Fig.4 Work Flow diagram of the study

3. Case Study project

Qaisary)Caesarea(Bazar (market place) is located in Lar. Lar is the most southern city of the Fars province of Iran. Lar is located 330 km southeast of Shiraz and 190 km North West of Bandar Abbas. Lar, the center of Larestan is considered as the largest city in the Fars province. The altitude of Lar is 806 meters above sea level.

Lar is a sample of an urban planning belonging to the pre-Safavid dynasty. Continuity of the Bazaar of Qaisariye after the historical earthquake event and its planning and expansion and construction of a Square with polo gate and surrounding porticos show a unique complex of urbanization from the post-earthquake period. Qaisariye Bazar was built during the reign of Shah Abbas Safavid. From the planning viewpoint, it can be compared with the Bazaar Vakil market in Shiraz and Bazaar Qaisary market in Isfahan. This market is a fine collection of diverse ancient architecture and the oldest market in Iran. There could

be seen typical effects of methods and techniques of past architectural school of thoughts from the pre-Safavid era to Qaisary.

According to Arthur Pope, a recognized Iranologist, Iran is ranked first in building domes made out of bricks. Iranian talented architects solved the complex and problematic issue of "dome on four walls and four corners" while Roman engineers and architects were not able to resolve this issue. This engineering resulted in artistic buildings in the Safavid era. Emergence of this perfection is the result of progressing along centuries from the time of the Parthian and Sassanian to poetic adorned buildings if the Safavid era. The internal facing of the main dome is made of rock. Four long corridors "North", "South", "East" and "West", make up the main skeleton of the Bazar. The corridors intersect at a four way junction called "Char Sough" in Persian. There are 13 pairs of shops located at each side of the southern, eastern and western corridors, also 14 pairs of shops are based on both sides of the northern corridor. The main building, a very old market, is around 1300 years old.

According to the seismologic map of Iran, Lar is located at a seismic zone with a high risk. Numerous earthquakes have frequently destroyed Lar since 700 years ago. Statistics show that almost every 45 to 90 years, Lar has been shaken greatly and destroyed. The most recent quake happened on the 24th of April 1960 with the magnitude of 6.7 on the Richter scale. 450 were killed while the whole population was 14000. The Bazar remained intact in that event but historical records show that it has been reconstructed several times. The last repair was done in 1892 at the time of Qajarid Dynasty and the earlier reconstruction work was conducted in 1605 at the time of Safavid Dynasty.

Other than earthquake, Qaisariye Bazar has partly faced the risk of flood. City of Lar is placed in a region with arid climatic condition. It may look like that it never floods there. But the facts and figures indicate that every few years, a rather sever urban flood inundates Lar due to heavy rains. This flood imposes sever damages to many different sections such as houses located in old parts of the city, streets, nearby agricultural farms and micro industrial units. The amount of the damage is considerable. The mentioned bazar which is located in an old place in this city is not protected against such floods and gets partially ruined. So it is very common that the Cultural Heritage Organization takes action to release water from flooded zones and also to repair the damaged parts. Two main risks of earthquake and flood are apart from the risk of dust storm which is ranked lower along with the routine risks of damages due to aging, erosion and risks pertaining to human activities.

Seismicity of Lar

So far. Various earthquakes happened and destroyed Lar. Once in 1871, the other time in 1911 and the last devastating earthquake happened in 1960. According to the recorded earthquakes, within 1913 and 1970, the frequency of the happened earthquakes could be shown in Table 1.

Table 1 frequency of happening of earthquakes in Lar

Earthquake intensity in Richter	4-4.9	5-5.9	6-6.9
The number of events	20	24	2

Heritage Value assessment for Bazar Qaisarieh

Having a very close look to the attributes of the bazar, it is possible to divide them into three different parts including the followings;

- Structural elements of the bazar
- Non-structural elements of the bazar
- Intangible attributes

The reason for classifying breaking up the Bazar into different elements is to address different classes of attributes with different risks. So that it is possible to analyze the impact of any estimated risk on different attributes. Thus, it would be possible to estimate the risk of any hazard on different attributes. Consequently, appropriate solutions would be assigned to any attributes with any specific risk.

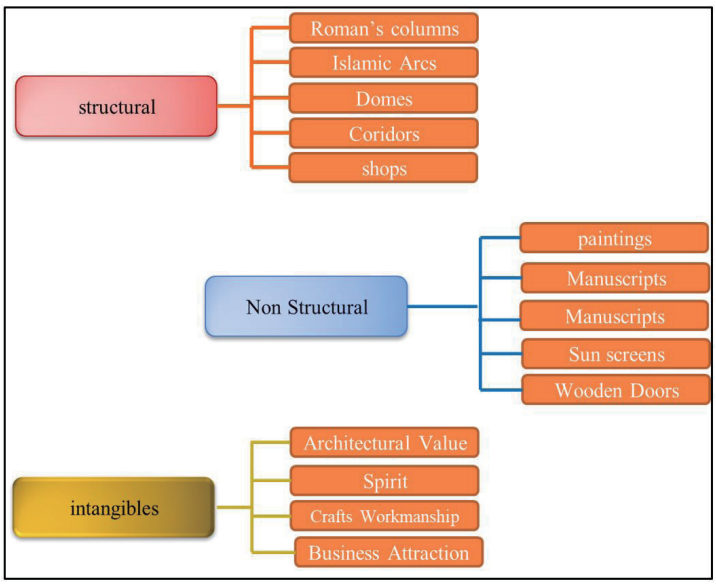

Fig 5 classification of different attributes of Bazar Qaisarieh

4. Risk Analysis of the Cultural Heritage

Risk assessment of the attributes at this stage has been done based on sound experimental judgment which is arisen from the site visit and study of existing reports, fact and figures relevant to the case study. For this qualitative assessment, three elements have been exploited as Hazard, vulnerability and impact where integrating them will results in four risk levels which ranges from highest degree to the low degree. In accordance with Figure 6, the highest risk for the Bazar is the risk of earthquake which is considered as the highest degree. Risks of fire and urban flooding are placed in the high level. Theft is estimated to be in the medium level. Finally, Low level risks are namely the risk of dust storm, typhoon and sink holes due to subsidence.

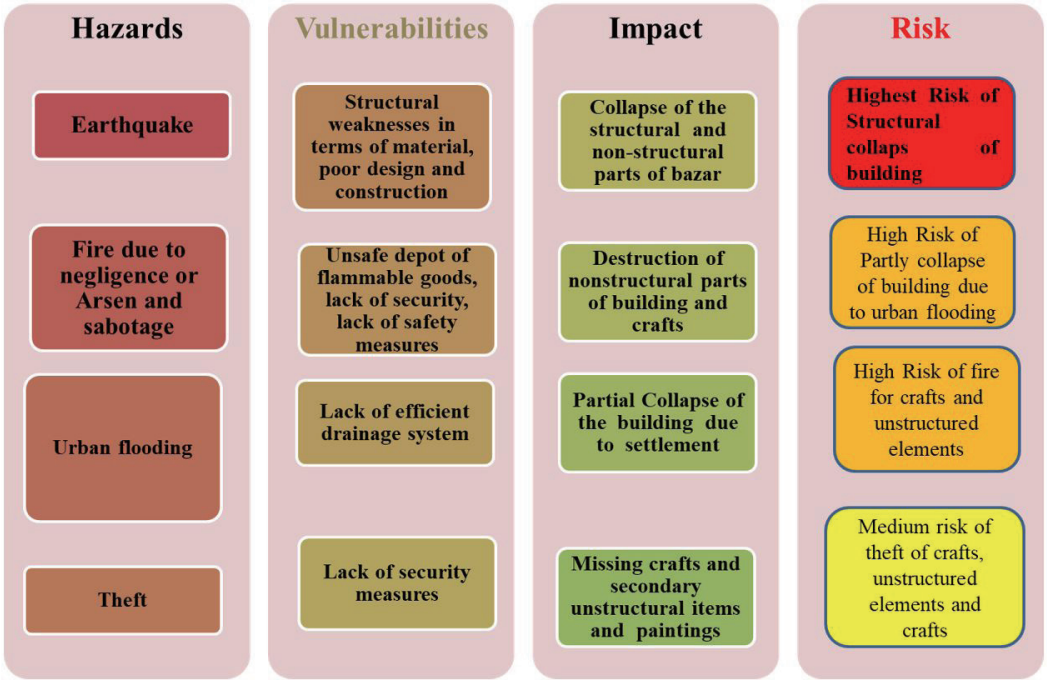

Fig. 6 risk priorities of Bazar Qaisarieh

Creation of Risk Scenarios

Scenario building for identified risks is a very essential way to visualize the function of risk regarding respective attributes of the Bazar. In addition, one can imagine the mechanism of how a risk will make an impact on the affiliated elements. Besides, the information gained from every scenario will help in finding specific solutions accordingly. It should be mentioned that a series of scenarios could be designed for the happening of any hazard that ranges from low impact to highest impact. The worst case scenario depicts the most tragic situation that would be imagined as the consequence of an event. A number of scenarios relevant to higher risks are displayed in Fig. 7.

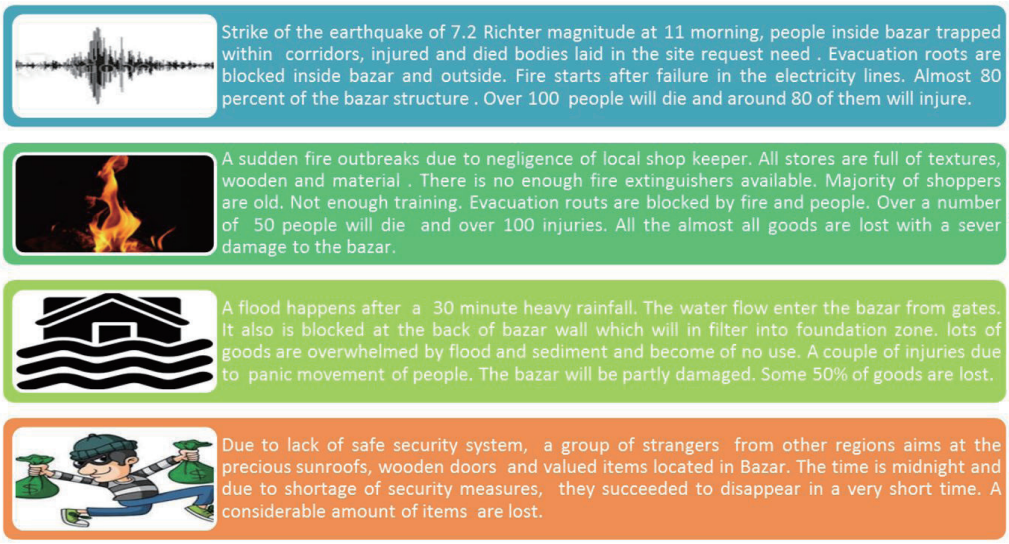

Fig. 7 sample scenarios for higher risks assessed for Bazar Qaysarieh

5. Disaster Risk Reduction

In order to manage the risks of disasters on cultural heritages; it is essential to address any at risk attribute and focus on the nature of damage it would be induced from the specific hazard. As mentioned earlier, damaged attributes are not only structural ones but also spiritual attributes. There are numerous remedies that could be hired for reducing the risks and are different in terms of know-how, cost and time. In order to help decision makers it is necessary to priorities them based on availability of budget, technical resources, time and man power.

There are two different classifications of risk reduction solutions including structural and non-structural ones. Structural measures are of physical nature and while non-structural measures are of managerial nature. Table 1 displays a number of structural and non-structural measures that could be implemented in order to reduce the estimated risks of hazards on different attributes.

Table 2 Matrix of Risk Reduction Measures

Hazard	Attribute	Applicable Measure	structural	Non-structural
Earthquake	Bazars structure	Strengthening the domes and	✓	
		Monitoring building structural elements	✓	
		Earthquake Emergency Action Plan		✓
Fire	Existing materials and goods and wooden building parts	Installation of fire distinguisher devices		
		Rearrangement of existing electricity system		✓
		Installation of smoke detectors	✓	
		Training the stuff for fire emergency situation		✓
Urban Flooding	Bazars structure and goods in shops and storages	Design and installation of drainage system in site area,	✓	
		Water proofing the roof and back of the Bazar	✓	
		Use of temporary flood walls	✓	
Theft	Moveable parts of bazar like doors, sun-roofs and crafts	Implementation of three security layers		✓
		Installation of CCTV	✓	
		Hiring custodians for protection of Bazar		✓

6. Summery

Disaster risk management of cultural heritages is a complicated issue for many decision makers in terms of technical issues, budget and strategy. In many cases, authorities just can cope with routine defects like dissociation, decay, aging, oxidation and so on. But the bigger problem is related to the unexpected risks of disasters with high magnitude and uncertainty that abruptly causes much more damages to cultural heritages as invaluable assets.

In the current paper, it has been applied a paradigm for disaster risk reduction of cultural heritage sites.

The method used is taken from the methodology developed by ICCROM. The way it looks to the issue is very comprehensive in a way that addresses any elements and aspects of a cultural heritage exposed to any kind of risk. In order to implement the mentioned measures for ant cultural heritage site it is necessary to first conduct a study regarding risk assessment and analysis. Then to find effective solutions to mitigate the risks. In real scale, the so called study requires to perform in regional level, site level, cultural level itself and finally ranges of attributes. This way all possible and probable risks would be covered in the study.

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