

## **GLOBAL BLUEPRINTS FOR CHANGE**

**First Edition--Prepared in conjunction with the International Workshop on Disaster Reduction convened on August 19-22, 2001**

The Global Blueprints for Change contain guidance for working together to improve the capability to identify indicators of physical, social, enterprise, and environmental vulnerabilities throughout the world and to select and implement realistic solutions to reduce them towards acceptable levels.

**Theme A: LIVING WITH NATURAL AND TECHNOLOGICAL HAZARDS**  
**Topic A.11: Reducing Risk to Cultural Heritage**

**“Reducing Risk to Cultural Heritage in Algeria and the Maghreb”**

**This contribution was prepared by Amina a Foufa-Abdessemed,  
University of Blida, Architecture Institute, Blida, Algeria**

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# REDUCING RISK TO CULTURAL HERITAGE IN ALGERIA AND THE MAGHREB

Amina A Foufa a-Abdessemed<sup>1</sup>

**Abstract:** This Blueprint for Change is written on the basis of experience in Algeria and the Maghreb region. The aim is to provide guidance to communities throughout the world that are seeking cost-effective ways to preserve and protect historical buildings, antiquities, monuments, and other national treasures from the potential impacts of natural and environmental disasters.

## Background

The history of humankind is partially represented in the historical monuments and sites around the globe and thus for sure need preservation. The vulnerability of the cultural heritage is growing every day, due to age, deterioration of materials by geophysical and environmental conditions as well as by human interaction. Cultural heritage is found in most of the countries and thus constitutes a growing concern among the governments and the population alike. Great interest has been shown to preserve the world cultural heritage as many programs were initiated by local governments as well as by International Organisations as UNESCO.

As awareness about the human values is growing every day, the world cultural heritage is considered as a universal site to preserve and to transmit to future generations in all the diversity of their authenticity. For this purpose which is an international understanding, it is thus imperative to establish fundamental principles which will lead preservation, conservation and restoration of historical buildings and to make them known to the world level.

The restoration and conservation concern mainly the artistic patrimony, but are also applied to the protection and preservation of archaeological monuments, architectural buildings, sites and historical sites.

Most of the world's cultural heritage is located in active seismic zones, which accelerate the vulnerability of these constructions. These constructions should be preserved over time and mainly against earthquakes, which nowadays constitute the most devastating phenomenon. Earthquakes are a complex societal problem, because they have a low annual probability of occurrence, but high probability of causing significant damage to structures. The recent damaging earthquakes in Turkey, California, Japan, Taiwan and India have one more time proved the urgency need to take practical steps to reduce earthquake risk.

The largest cities in the Maghreb countries built between the XVIII and XIX centuries, Algiers (Algeria) and Tunis (Tunisia) seem to constitute a homogeneous block which is due to their belonging to the Ottoman era. However, other large cities in north Africa, none Ottoman, but Idrisside as Fes (Morocco) present similar structural, functional and constructive characteristics as Arabic cities in North Africa, which may help to study the various problems related to these factors. These historical cities are located in the highest seismic active zones in north Africa which extends from Agadir (Morocco) through the north of Algeria to the Gulf of Gabes (Tunisia).

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<sup>1</sup> University of Blida, Architecture Institute, Blida, Algeria

The fact that these historical cities exist today despite the numerous seismic events that hit their sites; implies that in the past there was a certain awareness of the seismic risk and thus the development of an ancient constructive preventive technology during the reconstruction of structures following a disaster. This has probably engendered a local seismic culture characterized by local preventive measures. Concerning the Casbah (old nuclei of Algiers built in 1520) which was seriously damaged during the 1716 earthquake, it is said that the Dey (Governor) in that time decided while reconstructing the city to impose preventive techniques that he decreed and which some of them are being studied today.

In Morocco, the medina of Fes under the dynasty of the Allaouites also suffered very much from the devastating earthquake of Lisbon 1755. It is of interest to know if the city was rebuilt by taking into account preventive measures at that time and also how much was the awareness level of seismic risk reduction?

In Tunisia, the medina of Tunis had been seriously damaged by the 1758 earthquake. It is also of great interest to know if its reconstruction had followed the same techniques imposed by the Dey in the reconstruction of the Casbah. Tunis, as an Ottoman city, could be built using same techniques as in other Ottoman cities. A complete analysis of these old cities in north Africa will enhance our knowledge about the eventual seismic risk reduction preventive measures taken in the reconstruction of the old cities and for sure will allow us to better propose preservation techniques.

The limitation in space and time constitutes a homogeneous sample which may represent quite well the old cities in North Africa. It is also to establish a coherent corpus which we limit to three large old cities Algiers, Fes and Tunis after the respective damaging seismic events of 1716, 1755 and 1758.

The notion of Local Seismic Culture started in 1987 following the Open partial agreement approved under the authority of the European Council against natural and technological disasters. Local seismic culture is defined as the set of knowledge of the seismic history of the region considered, the response of the soil, the buildings as well as the behavior of the population.

The protection and the preservation of the cultural heritage from natural and environmental disasters make compulsory research work on the methodologies ancient communities concerned have built their constructions during centuries to resist earthquake loads. The analysis of their constructions by a detailed archaeological reading may bring the first lessons of which the omission may increase the seismic disaster impact. In order to reduce seismic risk, it is important to develop a methodology for applying preventive measures through a better knowledge on the impact of destructive earthquake not only on buildings but also on the behavior of people. The methodology consists of confronting historical, scientific and technical knowledge of the ancient structures in order to establish a realistic approach together with fundamental instruments to reinforce the historical building according to the local environment. The main objective of the revival of an eventual local seismic culture is to preserve old building traditions and to update them and eventually using them in the preservation of historical monuments and sites. The preservation of the local seismic culture is not only in terms of technique matter, it implies also the compatibility between the needs of the community and the preservation of testimony of its culture. It is only with this condition that recovered building techniques may be applied to the community concerned.

The assumptions on which the research is based on how to recover the local seismic culture are:

1. The efficiency to replace the control regulations by standard local procedures in order to have from each context the technique response which will be used to adapt interventions to specific needs of the structural system.
2. Apart from the reduction of the vulnerability of the system, the recovery of the local seismic culture allows to highlight professions, techniques and local resources together with the increase and preservation of the local culture.
3. The conflict is characterised on one hand is the development of recovery techniques and the seismic protection adapted to local specificities of the structure and on the other hand the promotion of their diffusion and use.
4. The revalorization of the knowledge of the old buildings construction techniques will give a new impetus to reinforcement techniques, repair and transformation and present a better protection to cultural patrimony.

### **What should we do strategically to improve political and technical capacity on this topic?**

In order to preserve and protect historical buildings, antiquities, monuments, and other national treasures from the potential impacts of natural and environmental disasters, the first phase is to understand how ancient communities have built their cities.

Our strategy is based on the study and analysis of the old core of the Casbah of Algiers which was built during the XVI century and have resisted numerous disastrous seismic events. This has lead us to deduce that, even at ancient times, disastrous events gradually generated seismic risk awareness with the development of protective measures. It is assumed that the protective arrangements developed gradually over time, in empirical manner, by the ancient inhabitants in high seismic active zones, as technical response to a recurrent disastrous seismic event. Therefore, these protective arrangements may well explain that historical buildings, far of being weak and dangerous, and far from presenting a high vulnerability with respect to nowadays constructions, could be considered as having survived with success numerous damaging earthquakes during several centuries.

Some arrangements of which we cite as references as structural system, bracing, floors structures, urban composition have been put in evidence following investigations on the site at the Casbah of Algiers, the Dey Palace, Dar Aziza and at the Bastion 23. These constructive techniques, have certainly played an important role in the resistance to earthquake loads and thus allowed the Casbah to resist the disastrous Algiers 1716 earthquake and those which had followed durin the XIX century, have been imposed to the inhabitants of the Casbah by the Dey of Algiers during the reconstruction phase in 1716.

However, the rediscovery of these protective arrangements or local seismic culture requires certain activities for each site under investigation:

- (1) The re-evaluation of the historical seismicity which should be as complete, homogeneous and precise as possible and also as back in time as possible according to the availability of data.
- (2) A detail evolution analysis (topology and morphology) of the construction procedure separately and in the context of the whole urban site and its interaction with other buildings, in respect with the frequency and intensity of seismic events that occurred during the period of time of interest.
- (3) An inventory of all "anomalies" met in buildings or in the whole urban site.
- (4) A confrontation between these "anomalies" met in various parts of the buildings (e.g., walls, floors, windows, etc.) and the modern today's techniques.
- (5) Those traditional techniques found in old buildings and which are proved to play a role in resisting earthquake loads could be proposed to be used nowadays to preserve the world cultural heritage from earthquakes.

### **How should we implement these strategies?**

The plan for the preservation of historical monuments and sites proposed in this blueprint develops practical procedures to preserve and prepare these cultural heritage from future disastrous earthquakes in north African countries. The techniques proposed in this plan are meant to be efficient, useful and cost effective.

In the framework of the global blueprints for change the following strategic plan is proposed:

- (1) Politically, accept that historical buildings are not only objects to preserve but they also constitute a national and regional scientific resource.
- (2) Promote these traditional seismic protective measures rediscovered in historical sites.
- (3) Contribute to the understanding of these arrangements or constructions tips that have protected the historical monuments and sites.
- (4) Analysis and study of the evolution of the construction procedure during the last centuries (typology, morphology).
- (5) Characterisation of the seismic source parameters on the region under consideration.
- (6) Integration of these techniques into national building codes.
- (7) Revival of old professions capable of dealing with historical buildings.
- (8) Study the effects of an expected seismic event (i.e., a scenario event) on the site containing a relevant historical structure, using the scenario to characterise the behaviour of different structural typologies, including local seismic culture elements.
- (9) Identify the main historical monuments and sites at risk, in order to take reinforcement actions of the relevant structure by implementing these traditional techniques.
- (10) Transmit the traditional seismic preventive techniques to decision makers and end users.
- (11) Provide end users (engineers, architects, decision makers, politicians, civil protection, etc.) effective and comprehensible descriptions of the procedure.

The above propositions constitute the starting point for the development of an efficient and cost effective preservation strategic plan for cultural heritage.

### **Barriers to implementation**

The strategy proposed in this blueprint has been designed with the purpose to take advantage of the currently available knowledge in science and technology in order to reduce the vulnerability of cultural heritage for future disastrous seismic events in north African countries.

The barriers to implement this plan may arise from the misunderstanding of these traditional measures by civil engineers, architects, politicians and decision makers. It may come also when the traditional technique could not be clearly explained.

Most of today's vulnerability assessment techniques are very much engineering oriented and do not address the economic and social aspects of the preservation of historical monuments and sites properly. Thus, sound vulnerability assessment methodologies are not being used by communities and people that are supposed to use them, and are not contributing considerably to the seismic risk reduction procedure.

### **Recommendations to overcome these barriers**

Research in traditional seismic preventive technology "local seismic culture" constitutes a study which will generate considerable consequences in medium and long term to the profit of the rehabilitation of cultural heritage. In fact, the practice of a adequate reinforcement intervention will be assured by:

1. Developing a sound culture of preservation by incorporating local seismic culture through universities and official authorities.
2. Developing an intervention methodology for the preservation of historical monuments and sites based on science.
3. Producing an exhaustive traditional preventive techniques catalogue including their role and their use as a practical tool.
4. Diffusing knowledge acquired by the training of qualified workers in the field of preservation.
5. Concentrating on cost effective and social impacts of the preservation actions.

We believe that such a plan will be successful in protecting our cultural heritage.