EUROPEAN UNIVERSITY CENTRE FOR CULTURAL HERITAGE
Ravello

ATLAS
of Local Seismic Cultures

HOW TO REDUCE THE VULNERABILITY OF THE BUILT ENVIRONMENT BY RE-DISCOVERING AND RE-EVALUATING LOCAL SEISMIC CULTURES

CULTURAL HERITAGE, SEISMIC CULTURE AND VULNERABILITY

Hazards and Hazard Culture

It stands to reason that the local culture in areas which are regularly hit by disasters is affected by the idea of hazard, i.e. the occurrence of natural calamities such as earthquakes, floods etc. Yet not all types of hazard result in specific techniques being developed. Floods and avalanches, for example, would condition the choice of location for settlements or buildings rather than the actual construction techniques of the buildings themselves.

It thus follows naturally that the recurrence of earthquakes in seismic areas has led to specific construction techniques becoming firmly established. Indeed archaeologists and experts in vernacular architecture are fully aware that local building methods in seismic areas often include aseismic measures (fig. 1).

Safe (or almost safe) Monuments

In general, such measures can be seen in the "major" examples of cultural heritage (temples, churches, convents, palaces) or in large-scale works (bridges and aqueducts). In other words, constructions in which the system has made serious investments. If these measures are easy to spot nowadays it is because the monuments have been able to benefit, generally speaking, from maintenance on a permanent basis since any modifications have had to be approved by public bodies; it is also because they have been the subject of research projects which aim to identify and establish which techniques are most suitable.

In short, the general attitude of decision-makers was - and still is - such that monuments are relatively well protected.

Minor Historical Constructions: an awkward category to protect

Minor examples of cultural heritage i.e. all those buildings which document the cultural identity of the local community, cannot benefit from institutional protection because they are not classified; even if they were originally aseismic they are now in a very vulnerable position. These buildings are seldom the subject of routine maintenance and indeed are very often modified without respecting their original characteristics; the (limited) economic resources of their owners are frequently used to make the building more comfortable, if not just to make it look prettier, instead of actually re-inforcing the structure; furthermore, technicians are employed who can only be controlled and checked to a limited extent.

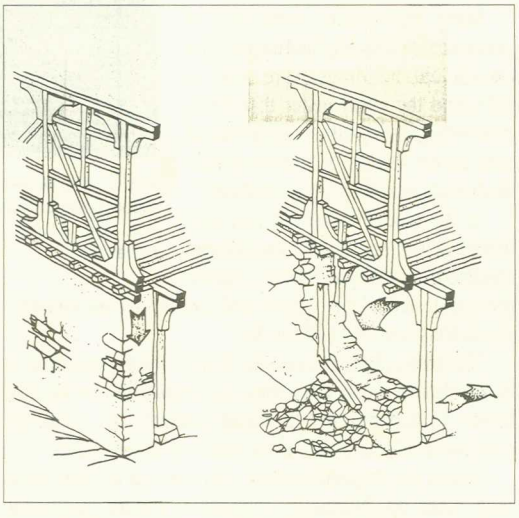

Fig. 1 - Lefkas (Greece). In an island where frequent earthquakes cause destruction, a double structure saves human lives and enables damage to be rapidly repaired. (Touliatos, 1993)

Why should we worry about the common built environment?

In actual fact, richer countries are nowadays rapidly developing technologies to rehabilitate buildings and are paying more and more attention to the cultural value of older buildings. In this context a (critical) re-evaluation of traditional

techniques is developing, especially concerning the restoration of monuments.

Yet it should not be forgotten that the sum-total of deaths caused by earthquakes is due to houses and blocks of flats collapsing and to the fact that many of the major seismic regions lie in the "poorer" parts of the world.

In developing countries the loss of certain technical expertise is rarely compensated by up-to-date know-how. Even buildings constructed with aseismic techniques are carelessly modified and techniques which are still applicable are gaily abandoned.

Thus, whenever an earthquake strikes, a basic ignorance of traditional techniques means that engineers declare houses unsafe when in fact, they are not (and in the process increase the number of homeless), or they underestimate the latent hazards in a building with apparently minimal damage (with the added danger of further tremors taking place).[1]

In the reconstruction phase it is often the case that the local technology which used to be a direct expression ofthe physical, economic and social context is actually done away with in favour of imported methods and products (sometimes imposed) which are not always appropriate.

How aseismic regulations do not replace the so-called seismic culture

Many earthquakes, especially in poorer regions, highlighted the fact that certain old buildings were able to withstand the event better than more recent ones, and that the damage caused was almost always due to unsuitable modifications and/or "reinforcements".

In the case of both old and new buildings it was clear that most damage resulted from both the disrespect of the tried and tested rules of the past and also the fact that aseismic regulations were not adhered to.[2]

This came about because the former were considered to be obsolete (or, more often than not, because they were only known to experts) and the latter because they were not considered effective but only a source of higher costs.

Indeed the two phenomena combine and actually back each other up. Normally, regulations ignore traditional aseismic technologies and thus minimize their value. On the other hand, since these rules are new, they cannot benefit in the slightest from what little remains of the so-called "seismic culture".

In short, the consequences of an earthquake are actually more serious because the local community is no longer familiar with the traditional aseismic techniques adopted in the area and also because the aseismic regulations have not in fact become part of their "culture".

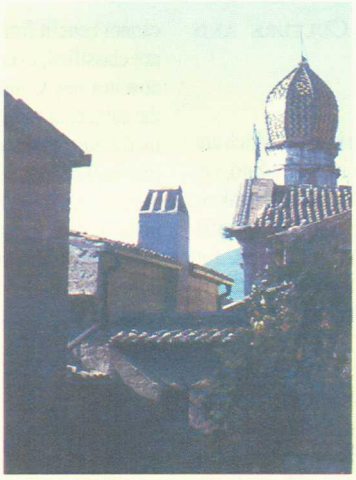

Fig. 2 - It is almost impossible to represent older constructions with reliable models, thus it is very difficult to predict their seismic behaviour.

How to protect the present-day cultural heritage in order to reduce losses.

A critical re-evaluation of traditional aseismic technologies can indeed result in a more effective prevention, a more appropriate relief action and less harmful rehabilitation.

Such an approach becomes even more necessary whenever one considers that in many seismic regions a major part of all constructions (40 - 80%) pre-dates the reinforced concrete era; that the actual building is used by individuals for personal use i.e. their behaviour cannot be easily influencenced or controlled; that the traditional rules applied to old constructions can often be employed in recent masonry constructions.

But how can they be recognised in a building which has been modified after centuries of use? How can one choose the techniques which are still effective? How can they be applied on a regular basis?

Providing definite answers to these questions has been the objective of a research project carried out by the European University Centre for Cultural Heritage (EUCCH) in Ravello, Italy, entitled "How to reduce the vulnerability of the built environment by re-discovering and re-evaluating local seismic cultures".[3]

The Limits of the Present Approach

The exact sciences and cultural heritage

The latest technologies are being more and more sought after when protecting monuments against earthquakes; these range from computer-processed mathematical models, ad

1) In the manual published by the World Health Organisation on the response within the first 72 hours following a catastrophe (D.A.R.E. "Developing Appropriate Responses for Emergencies") the EUCCH collaborated on the chapter dealing with the re-discovery and re-evaluation of Local Seismic Cultures as one of the actions to reduce the consequences of the earthquake.

2) Cases worth mentioning are those in Italy (Friuli, 1976; Irpinia, 1980), Greece (Kalamata, 1986) and Turkey (Erzincan, 1992).

3) In 1987 the Council of Europe promoted a programme to reduce the consequences of catastrophes (under the official name of "EUR-OPA, Risques Majeurs", (Open Partial Agreement) on the prevention of, protection against and organisation of relief in major natural and technological disasters) based on the action of 15 Specialized Centres. One such centre, the Ravello Centre, is developing a research and training programme in the field of protecting the cultural heritage in seismic areas.