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EFFECTS OF THE LATEST EARTHQUAKE

Our analysis of damage to and the condition of the buildings at the time of the earthquake of 23 November 1980 had a twofold objective: to compare the present damage with that sustained in other major earthquakes and to see if there was any link between the damage and the way in which buildings were used.

It was realised, however, that repeated damage could not be considered as something automatically qualifying for inclusion in the local earthquake culture (e.g. as an index of the risk levels of particular areas). Since present-day methods of damage assessment are not the same as those applied in earlier times it is not possible to make a technically and scientifically meaningful evaluation of recurrences. Moreover, any correlation with damage needs to be evaluated carefully, because damage reports submitted with a view to obtaining financial grants cannot be trusted.

The study does not claim to be exhaustive. It seeks to provide the data needed for a more profound analysis of the vulnerability of the buildings of San Lorenzello and to illustrate the methods employed.

Based on the analytical grid, our investigations were designed to assess some of the factors which increased vulnerability as a result of the behaviour patterns of the community, namely:

- the use made of buildings;
- the resources available for maintenance, and
- the buildings' recent history.

Specifically, we obtained findings on the following factors, which were incorporated into the plan:

1) damage caused by the earthquake of 23 November 1980, so that we had a standard point of reference for all our other analyses;
2) how buildings were occupied, so that we could establish any correlation between use/non-use, permanent/occasional use and the damage sustained;
3) family incomes, so that we could calculate the proportion of resources probably spent on maintenance;
4) measures taken prior to the earthquake, so that we could analyse any correlation between damage to buildings and the maintenance work done on them. The analysis was taken further by making a distinction between routine maintenance and specific operations required for static reinforcement.

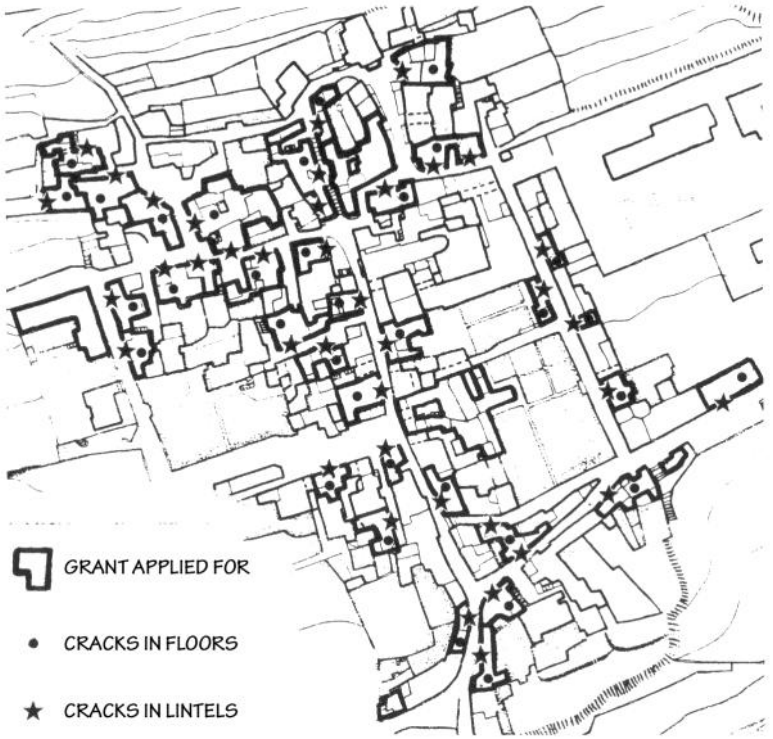
We had also intended to compile a table showing in greater detail the nature of the damage sustained by individual buildings (nature and direction of cracks, location, etc.), thinking that we could ascertain this from the drawings appended to applications

for grants. But we found that all the drawings showed the same kinds of damage and thus proposed the same kinds of measures.

This would seem to indicate that earthquakes have always caused the same sort of damage irrespective of the construction type of buildings, how high they are, the materials used, maintenance work done on them, how they are occupied, and how well off their owners are.

But the most likely hypothesis is that the description of the damage is probably distorted by the end in view, which is to gain as much as possible by way of financial grants for repair work.

Since it was not possible to identify the types of damage to buildings directly and in detail, we opted not to proceed with this analysis.



1) Damage

The damage caused by the earthquake to private dwellings shown in the tables is that recorded on standard forms which were used throughout the area affected by the earthquake of 23 November 1980 and drawn up by the technical officers appointed by the authorities of the commune.

The indicators used to classify the damage were as follows:

SLIGHT: isolated cracks, widespread cracking, cracks in roof ridges (all minor); discontinuities in roofs, sagging of wooden floors.

MODERATE: widespread cracks, cracks in roof ridges, cracks at wall crossings (all minor); discontinuities in roofs, sagging of wooden floors, longitudinal cracks in any hollow block iron floors or iron floors with vaulting cells made of tuff or brick. Some rooms of the house have to be evacuated.

SERIOUS: widespread cracks, cracks in angled joins, cracks at wall crossings, compression cracks (all wider than average); discontinuities in roofs, sagging of wooden floors, longitudinal cracks in hollow block iron floors, or iron floors with small arches made of tuff or brick, cracks in any ceiling vaults. Building has to be evacuated.

2) Occupancy

This parameter describes how the various dwellings were used in the last 10 years preceding the earthquake, classifying them as follows:

- occupied all the time;
- occupied part of the time;
- occupied until recently;
- unoccupied.

Whether the dwelling was occupied by its owner or a tenant was not taken into consideration. Nor did we consider why the house was empty (whether it was a second home, or the building had already fallen into disrepair). In reality, however, these distinctions are important. As we have seen, the question of who owns a building can be a factor which increases its vulnerability. But our analyses were based on documents submitted to the town hall in the context of grant applications. Given that the damage listed in these files was more or less the same and that virtually all applications were for owner-occupied houses, any analysis of ownership would have been meaningless.

It was thus agreed that to assess the factor of increased vulnerability in relation to ownership, we would need to review the files carefully, and to extend the investigation to cover all the buildings in the historic centre (we already had the summary damage assessment forms for these, which had been used to classify the damage).

This factor will be studied at a later stage and in greater depth.

3) Family incomes

As a measure of the incomes of families living in the various dwellings it was found that tax records were totally unreliable. We found it more useful to rely on the "vox populi" and above all on the occupants' lifestyle. We thus concluded that the *visual aspect of houses* was an indirect indicator of income, but also that this directly reflected the portion of resources which was spent on maintenance, i.e. precisely the parameter we wanted to measure.

We thus decided to analyse buildings on the basis of this indirect indicator which indubitably yields more reliable responses than most socio-economic studies (indirect indicators of income - estimates of total resources - analysis of consumption - calculation of the portion spent on the family home).

We also judged it a good idea to prepare a classification of the visual aspect of dwellings which did not use absolute values (which are in any case hard to define objectively) but which took the average values for the community as its point of reference, so that only differences were recorded which could then be considered in relation to other parameters.

With these criteria in mind we grouped incomes into three categories:

- above average;
- average;
- below average.

4) Measures taken prior to the earthquake

a) maintenance

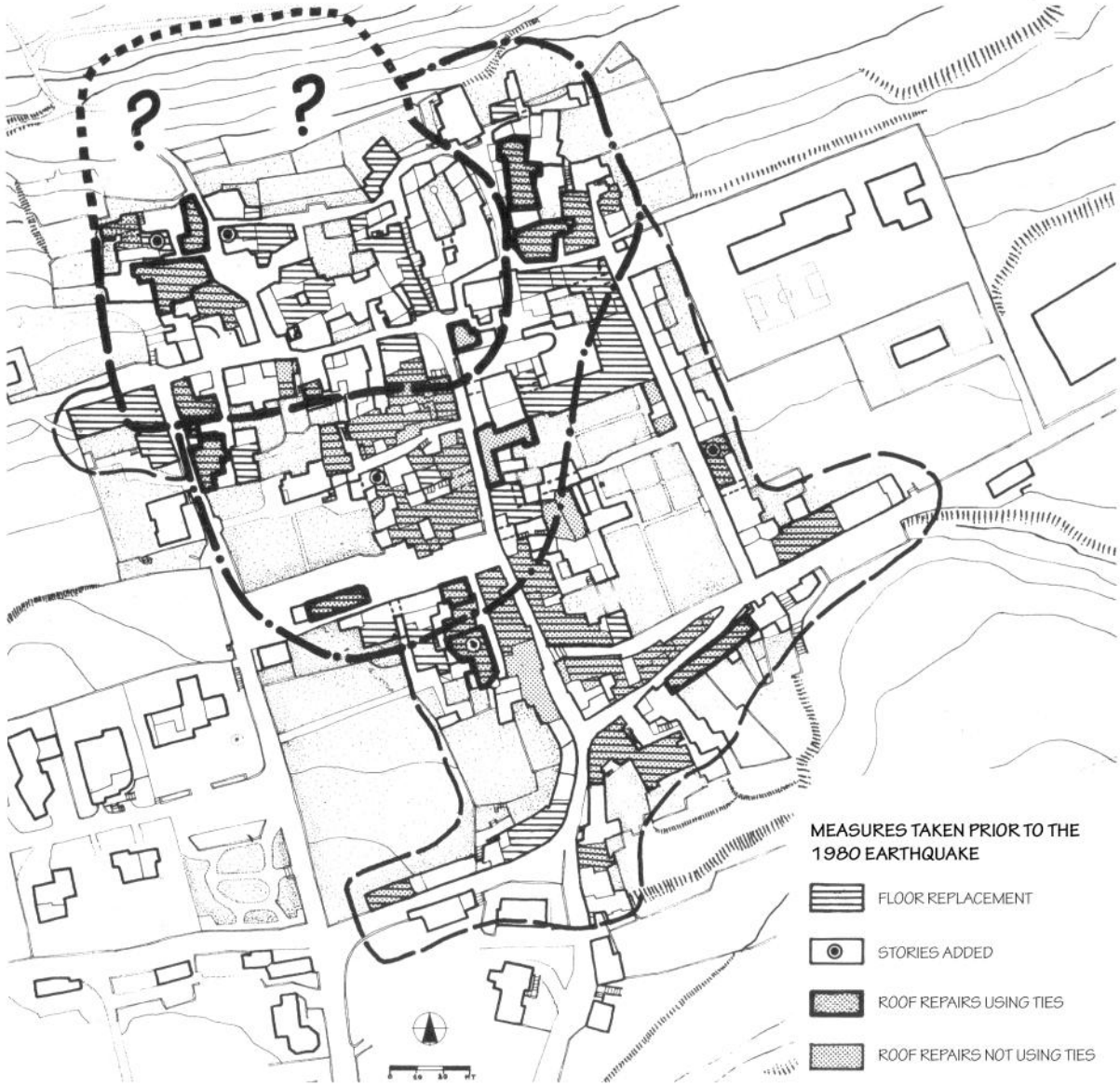
Maintenance was valued on the basis of measures taken during the 10 years prior to the earthquake. Buildings were classified as follows:

MAINTAINED: buildings which had had floors or certain wooden lintels replaced, the roof repaired and the plumbing improved;

RESTORED: buildings which had not only had specific restoration work done on them but had also been the subject of more major work such as: replacement of wooden floors, repairs to the roof, measures involving load-bearing walls (demolition and reconstruction or reinforcement); measures involving the foundations;

NO MEASURES TAKEN: none of the types of work mentioned above had been done;

NEGLECTED: not only had no work been done on the building, it had been poorly used and gradually fallen into disrepair as a result.



b) maintenance and static reinforcement

This diagram shows in detail the improvements to each building (made in every case prior to the earthquake of 23 November 1980). This analysis is of course already included in the previous table a).