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METHODOLOGICAL LESSONS LEARNED AND QUESTIONS UNRESOLVED

If the value of the San Lorenzello experiment were measured in terms of the enthusiasm generated amongst its participants, it would be deemed an immediate success. Over a six-month period administrators, municipal and local technical officers, experts and craftsmen responded spontaneously to the stimuli which emerged little by little and helped to move the research work forward.

In reality the project's potential was not fully realised (for example the enigma of the two-piece sills, the front doors set on the corner); and we deliberately opted not to pursue certain aspects (static behaviour of "dynamic groups", a review of the damage inspection sheets after the 1980 earthquake). Not because they were unimportant but simply because, firstly, we had to set priorities in view of the human resources and time we had available and, secondly, because the specific purpose of our research was to test the methodological aspects of the project and the instruments devised beforehand.

We have seen, for example, that modifications to buildings are motivated by two requirements: improved amenities on the one hand, and reinforcement after an earthquake on the other hand.

We have seen too that these two aspects can serve as parameters for classifying measures taken over the years.

Such a classification may appear banal. But it is a positive test of the methodological validity of the systemic approach. When applied to a specific case it gave a simple, immediate and rigorous form to what all the experts already knew: that buttresses, "contrast" arches, etc. are reinforcements, whilst added floors, widened doorways, etc. represent a danger in the making. The best experts also know that covered passageways and outside staircases are often intended primarily to strengthen the building and not to improve access, which is merely secondary.

The classification of anomalies in relation to parameters of static reinforcement and amenity improvement is thus an operating tool rather than a research finding. It may be used by the community for its own buildings, to perform - and implement the results of - analyses which are performed at present only by particularly meticulous and well prepared technical experts.

But the experiment proves that it is important too to follow procedures for recording and locating things meticulously, and not to succumb to the temptation to lump together all anomalies as elements of an earthquake culture.

The blocking in of a window close to a corner is undoubtedly a reinforcing measure. But that does not mean that all measures to close off openings should be understood in that light. For example, thanks to the alertness and thoroughness of the archaeologists "rooting around" in the archives, the team was able to establish a connection between an epidemic of swine fever and certain blocked-up openings which were so low and small that they could not have had any effect on the static behaviour of the buildings concerned. The hypothesis that they may have been piggeries closed down as a precautionary measure was confirmed later by vague recollections on the part of the inhabitants.

We also learned that it was essential, in order to avoid any uncertainty or leave questions unresolved, not to confine our analysis exclusively to the system with which the project was directly concerned. We were only able to reconstruct the anomaly of the window-sills and corner doorways and see where this fitted in with the local earthquake culture because we analysed similar features in Cerreto Sannita and other communes.

But in addition to the specific lessons learned, the experiment showed that it is possible and useful to develop "systemic rules" for protecting local systems against earthquakes. That is to say to define a set of methods, and specifically procedures designed not only to reduce damage to buildings (and the risks that creates), but also to change the way in which the various operators behave. To achieve this end, it is important that the community should be actively involved in protection and prevention (e.g. through the restoration of earlier knowledge and its dissemination, payment of the additional costs of doing detailed studies and encouraging the use of significant features of local building methods, etc.).

The research work proceeded in several stages:

- preparation of a standard methodological protocol for identifying local "rules";
- analysis of the local architecture to identify traditional rules of earthquake protection;
- selection and updating of any rules still valid;
- analysis of administrative procedures (protocols) and community behaviour occasioned by those rules;
- any adjustments to procedures;
- verification and definition of methodological plans;

- dissemination of the products of the research.

Possible products (e.g. of a pilot project similar to the San Lorenzello project) are as follows:
- monograph on local architecture;
- codes for analysing the overall (physical and social) vulnerability of the system;
- methodological plans for the compilation of local "rules";
- procedural plans to encourage the use of local resources and for protection against earthquakes (grants, promotion of craft industries, etc.).

We need, however, to emphasise a requirement which was repeatedly apparent during our research, both in the field and at the seminars, namely the need to combine research and methodological and technical thoroughness, on the one hand, with training, on the other hand. This, by spreading knowledge and developing local economic potentials, is the only way of guaranteeing that the earthquake culture of the system will be exploited to best advantage.

Critical appraisal of this experiment would be incomplete, however, if one failed to indicate not only the lessons which have been learned but also the questions which were raised in the course of the project but remained unanswered. One example is the ideal scale on which reinforcement measures should be carried out and their effectiveness evaluated.

If vernacular architecture - of historic value or not - is to be protected effectively, the approach used must necessarily be systemic. Analyses and proposals for measures must therefore cover the local system of community + architecture and must be defined with special reference to the behaviour of and relationships between the two subsystems (architecture and community) in response to earthquakes: before, during and after them.

This means, in effect, that both project and analysis must look at the:
- construction features of buildings, paying special attention to how they react to earthquakes and any traditional techniques of earthquake resistance;
- resources available for earthquake protection;
- procedures (action, funding, etc.);
- interests of the various operators involved in protection programmes.

It was found, however, that whilst the construction methods used for old buildings are relatively well known - or can be thanks to research projects of this type - the same is not true of certain basic theoretical formulae which are still being worked out. Those, for example, concerned with the continuous dynamic behaviour of buildings, or the long-term effects of newly introduced technologies, etc.

It also emerged from the project that correlations between the two subsystems do not compare like with like. In vernacular architecture, conversion measures (action by the community affecting buildings) are in most cases concerned with individual housing units, whilst the risks (action of buildings affecting the community) variously concern units, whole buildings, groups, and the urban fabric generally.

Consequently, if a systemic approach is to be employed, the only unit on which a coherent analysis of the behaviour of the two subsystems can be based is the individual housing unit.

Clearly, though, it makes no technical sense to analyse how an individual unit behaves unless we analyse the behaviour of a whole building or group as well.

The group is the smallest unit which can be sampled, for two reasons:
- it allows any architectural analysis to be meaningful;
- tests can be carried out on it;
- preventive programmes can be carried out on it;
- it often qualifies for substantial financial aid (public funds, economies of scale, etc.)

As we have seen, however, it is difficult to make models or simulations of groups which allow us to quantify existing or desired levels of protection.

Moreover, it is only recently that typical civil engineering methods have been applied to masonry structures. As a result there are not as yet any definitive ones, though for certain types of buildings, original calculation methods have now been devised. In this case an "eco-historical" approach may be more useful, given that this seeks to identify traditional earthquake protection "rules" in buildings. It allows us to measure the resistance of buildings as a function of how they reacted to past shocks and to update these rules using the technologies available today.

But this line of research is very new. It is only recently that people have begun to appreciate that certain "vernacular" building methods commonly used in Mediterranean areas (the tie-beams used under the Bourbons, timber frame structures, etc.) are essentially designed with earthquake resistance in mind.

It would thus seem that this approach is the best one for ensuring effective protection for old buildings. It does, however, require a methodology for analysing and implementing an action programme, which is yet to be defined more fully.