

Looking to methods and tools for the
Research in Design and Architectural
Technology

edited by

FILIPPO BOSI, PAOLINA FERRULLI AND ELISABETTA FOSSI

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The sustainability in the rehabilitation of minor
historic centres.

The case of seismic crater in Abruzzo Region:
strategies and compatible methods.

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Abstract

The research links the issue of rehabilitation of the small historic centres, that characterized the Italian territory, to the environmental issue. The sustainable recovery is seen as opportunity to carry out a virtuous action in the territory, in the name of recognition of the importance of towns in the local organization, their environmental value and the re-use of an abandoned built heritage.

The interest for these territories, particularly the inner area of the Abruzzo Region, hit by the earthquake of April 6, 2009, has offered the opportunity to carry out a research that aims to rediscover the present elements of environmental sustainability and to propose the integration of new forms of energy efficiency.

The research proposes the development of an operative methodology that helps to overcome the gaps of the reconstruction process and those related to the promotion of energy efficiency in historical contexts. The main area of interest is not the built fabric, but the one complementary to it, characterized by open spaces and energy networks, of which main aspects are highlighted.

The development of design scenarios allows us to involve different and complementary technological solutions in compliance with the case study, following a successful overcoming of a complex process of compatibility.

The methodology aims at the elaboration of codes of practice to be a support tool to main actors related to the post-seismic reconstruction to create smart minor centres, through the application of a network of different interventions.

It is being validated on a case study in the province of L'Aquila to verify the effectiveness of the presumed scenarios through the quantitative verification of the results and timing of application.

Keywords

Sustainability, Redevelopment, Minor Historic Centres, Compatibility

Introduction

Redevelop the existing building from an energy perspective is internationally a very topical issue and particularly interested is Italy, where the issue of property renovation represents more than 60% of the buildings production¹.

However, when the object of intervention is rich of values, introducing principles of sustainability in the recovery process is a complex objective: this is the case of the rehabilitation of small towns that characterize Italy, for a long time identified with the adjective minor, erroneous term arising from their dimensional characteristics, not qualitative (Secchi, 1984).

Although it is widely recognized the value of such heritage, the minor and abused, located mainly along the Apennines, have been affected for decades by conditions of depopulation and abandonment², due to the loss of economic power and the low quality of life for lack of services (Cervellati, 2009).

In recent years there has been a renewed interest in these centres, due to a variety of factors: first, the problem spread, as they are numerous in the area. Secondly, the recognition of the environmental value that characterizes them, and therefore the importance of the recovery in view of the preservation of the material and identity culture of places (Zordan et al., 2002).

Finally, in an era characterized by global energy crisis and by strong focus on environmental issues, it is important to resort to sustainable recovery, aimed at re-use to reduce soil consumption.

The research identifies its area of interest in the inner area of the Abruzzo region hit by the earthquake of 2009, where the latter has only aggravated an already critical situation.

The area included in the seismic crater³, in fact, has been the subject of negative changes relating to the organization of social and territorial settlements, which have led to further deterioration and abandonment of those towns today also compromised in their building structures (Figure 1).

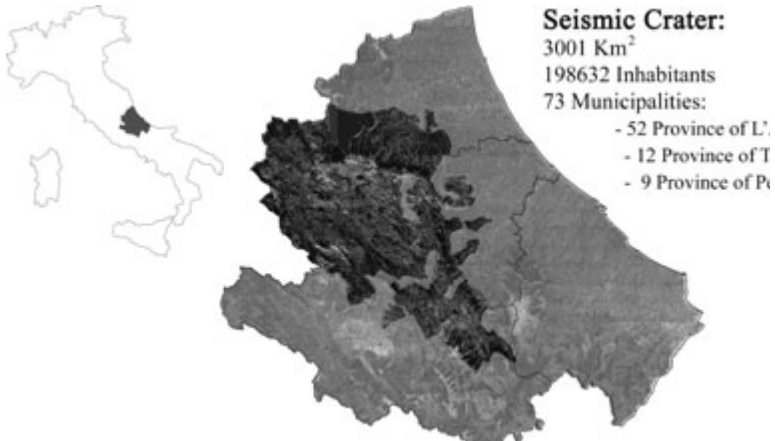


Fig. 1 The seismic crater [author]

Purpose and objectives of the research.

After recognizing the importance of the recovery of built heritage, of which we identifies the main characteristics, the research considers the earthquake not only as an aggravating factor for the already precarious balance of local communities, but as an opportunity for centres and their territory rehabilitation (Forlani, 2011), with the possibility of rebuilding, where it is possible and sensible, taking advantage of the technology quality to adjust the comfort levels to today's ones.

The goal is to exceed the regulatory limits identified in the first phase of the research both in the process of reconstruction, and in that of the national and regional legislation regarding the introduction of energy efficiency in the historical built heritage.

Thus, we propose a compatible process of recovery of towns affected by the earthquake, upgrading the performance indexes to today's users, in order to make attractive an architecture today disconnected from economic circuits, the only ones able to allow its survival.

The sustainability acquires a meaning in the proposed method if

considered as a comprehensive set of planning actions carried out at different scales of intervention: we need to move between the scale of built and the territorial scale in a congruent manner.

Starting from the recognition of the climatic and environmental potentiality of the area, the proposed methodology aims on the one hand to the reuse of a disused built heritage through the sharing of resources; on the other hand to exploitation, where it is compatible, of forms of sustainability, from sustainable mobility to renewable energy sources.

The methodological tool that the research outlines is thus aimed at the elaboration of codes of practice compatible with the minor historical centres in post-emergency situation.

The goal is to create smart minor centres through the promotion of a network system aimed at the transfer of people, information, and energy: such system is achieved by introducing innovative technological and compatible solutions in different areas and acquires stability if it is supported by realistic conditions of reuse.

Applied methodologies

The presented research aims at verifying the possibility to realize interventions that go beyond the built fabric, but rather to its service, intervening on open spaces system and on energy networks.

Thus the operational methodology aims to show how, through a careful meta-planning phase, it is possible to introduce systems related to energy efficiency, primarily renewable sources, even in the rehabilitation of minor historical centre.

In the light of examined state of the art and of post-earthquake situation of small towns, the study required firstly to identify the most appropriate approach to follow: a choice of method. Among the observed methodological approaches, the logic of case by case was considered closer to the object of the research (Rogers, 1957). It starts from a multidisciplinary analysis of the scope of investigation, and proceeds, after a diagnosis phase, with the development of design scenarios.

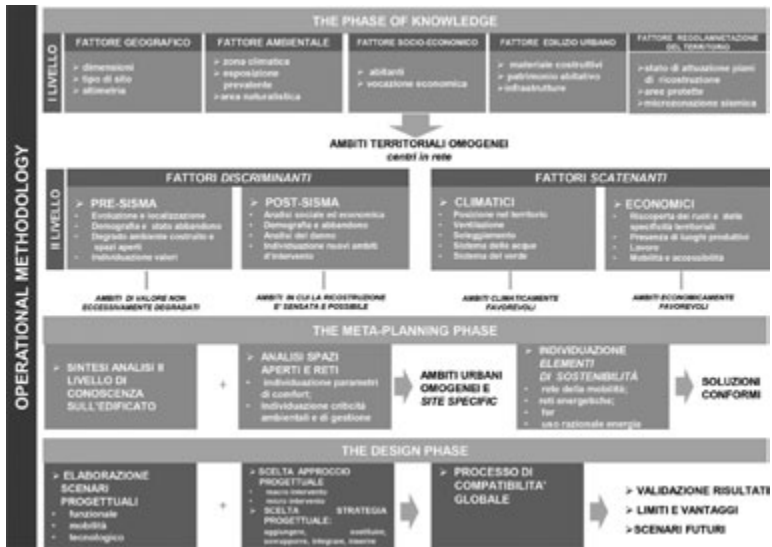


Fig. 2 The operational methodology [author]

It is essentially based on three phases, as showed in Figure 2:

- The phase of knowledge, which leads to the recognition of the town as a complex reality that cannot be separated from its environment. The identification of discriminating factors (pre and post earthquake) and triggering factors (economic and climatic), allows to identify design indicators in order to give intervention priority to some geographical areas.

- The meta-planning phase: after identifying the sustainable territories, it was decided to focus the attention on open spaces and energy networks, areas less investigated but that can offer significant performance improvements. The first are classified according to their morphological, functional and, especially, environmental aspects, through the analysis of climatic and biophysical factors, figure 2 (Sala, 2001). The analysis of the networks system (electricity, water, gas, sewer), through the in situ reconnaissance and data retrieval, has allowed us to highlight a difficult situation characterized by strong deterioration and lack of maintenance.

This leads to the identification of homogeneous areas for critical conditions and strong points, environmental and functional, where to locate site specific where intervene.



Fig. 3 Climate analysis: summer shadow, Fontecchio (AQ) [author]

The development of design scenarios, related to functional rehabilitation, sustainable mobility and energy networks, using different and complementary technological solutions, can be carried out only after satisfying a complex compatibility process, conducted on various levels (environmental, technological, functional and economic).

The identification of compliant solutions, occurred during a preliminary phase, was based on sustainability elements: rational use of energy, fulfillment of environmental comfort, sustainable mobility, efficiency of energy networks, exploitation of renewable energy sources. Of the latter, considering the sensitivity of the investigation area, we evaluate the insertion both in on-grid and off-grid modality (Marchionni, De Berardinis, Bellicoso, 2014).

Results and recipients of the research

The methodological process has required its validation on a case study considered significant: it has been chosen the territorial network characterized by Fontecchio, San Pio di Fontecchio and S. Eusanio Forconese, in province of L'Aquila. The goal is to verify

the effectiveness of the presumed scenarios through the quantitative verification of the results and timing of application.

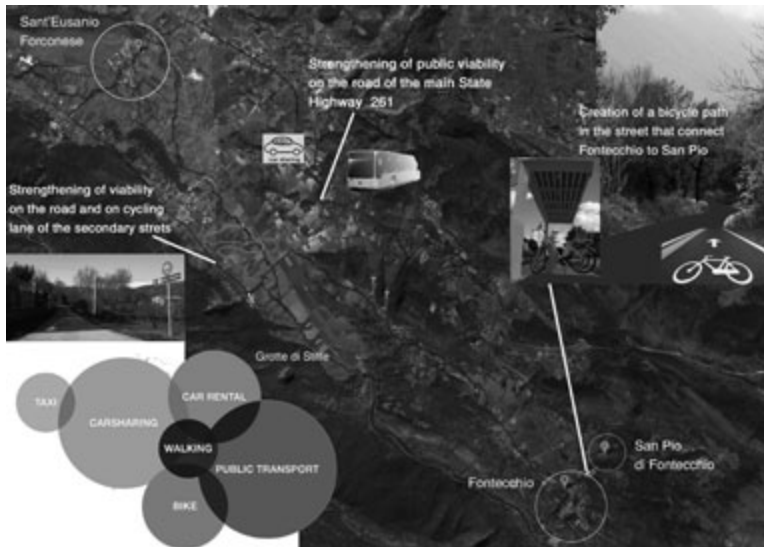


Fig. 4 Example of sustainable mobility scenario [author]

The methodology is intended to be a support tool to main actors related to the post-seismic reconstruction, therefore public managements and designers.

In particular, to the first we would provide a tool that overcomes the present incompatibility in SEAP (Sustainable Energy Action Plan), in order to combine the mere physical towns reconstruction with the technological and energy one.

Future developments

The next phase of the research aims at increasing the multi-disciplinary contributions related to the recovery process of the countries. In particular it is considered valid, in phase of knowledge, the deepening obtained by the use of technology by UAV (Unmanned Aerial Vehicle) for evaluation and thermographic study.

For the scenarios validation, however, it is necessary to enrich the methodology considering the economic component and the control of the management and maintenance process.

Conclusions

As highlighted by the proposed compatibility process, the problems related to the application of the analysed techniques are due to different factors: incompatibility with the context, technical deficiency, excessive costs, unfavorable times of realisation.

However, the test on case studies shows how, recognized on the one hand the values to be respected, on the other hand the need to introduce forms of energy efficiency, it is possible to overcome the normative and bureaucratic impasse that now prevents the recovery of abandoned territories.

This methodology, which can be enriched with a lot of technological solutions offered by the current market, provides an organic method that avoids the simple application of standard solutions and use of market products, but rather prefers the approach to the single case, that is a key concept if we truly want to respect and take advantage of the specificity of each context.

Howewew, even if it starts from the specific investigation context, which determines many of the elaborated considerations, the intention of the developed methodology is to provide meta-planning indications generally applicable to other sensitive areas hit by emergency situations.

Notes

1. Data by Cresme (Centro Ricerche Economiche Sociali di Mercato per l'Edilizia e il Territorio) 2012.
2. As is clear from recent studies carried out by Italian public companies such as Legambiente and Confcommercio, and private company like Norman Group, 72% of the more than 8.000 Italian municipalities have fewer than 5.000 inhabitants, of which 1.650 endangered towns in the projection to 2016. Source: Acts of the conference: "Ghost town. Hidden Treasures of minor Italy, June 23, 2006".
3. The area defined as seismic crater by the Ministerial Decrees succeeded after the earthquake (Abruzzo Decree n. 39.2009 and followings), occupies a portion of land of approximately 3000 square kilometers, comprising 73 municipalities (52 in the Province of L'Aquila, 12 in the Province of Pescara, 9 in the province of Teramo).

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