

Post seismic intervention strategies over the last fifty years in Italy (1968 – 2016). Initial observations about the vernacular architecture's conservation

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Abstract

The numerous reconstruction experiences after the great earthquakes occurred in Italy during the last fifty years (Sicily, 1968 – central Italy, 2016) have given way to a great improvement of the Italian post-seismic emergency management and differ from each other by their results in terms of degree of conservation of the pre-existent buildings. Through the summary analysis of the legislation adopted for the reconstruction process after the Belice (1968) and Friuli (1976) earthquakes, this contribution aims at investigating the peculiarities of the different intervention strategies adopted for the conservation of the traditional masonry buildings and the historical built landscape – to which they belong – recognised as the essential component of the Italian cultural heritage. Specifically, the 1968 and 1976 earthquakes provided an opportunity to enhance the cultural debate on the approach to the towns destroyed by seismic events and initiated an ongoing process which progressively moved towards an increasing recognition of the vernacular architecture's value.

Keywords: *post-seismic reconstruction; italian earthquakes; masonry; vernacular architecture.*

1. Introduction

Over the course of the last fifty years the earthquakes that struck Italy – starting with the 1968 earthquake in the Belice Valley, the first major seismic event after the two world conflicts, which launched a debate and an experimentation process still in place today – have produced a remarkable evolution in practices for the seismic emergency's management and the structural reinforcement of the damaged heritage.

This essay focuses on some of the early results of a major research¹ aimed at deepening the reconstruction models of nine earthquakes occurred in those fifty years; specifically, it addresses the post-seismic reconstruction strategies adopted after the events of

1968 (Belice valley) and 1976 (Friuli – Venezia Giulia), for which the current state of the research allows us to formulate some preliminary reflections. In this respect, the study of the reference regulations here proposed is functional to underline how these seismic events – although they occurred a few years away from each other – were distinguished by very different reconstruction programs, at least as regards the existent-built heritage's conservation. For these reasons, both the analysis of the reconstruction experiences and the specific actions aimed at the physical rebuilding of the damaged heritage allow us to highlight a wide range of intervention strategies within which it is possible to recognise the stages of an evolutionary process, related to the way of facing the conservation of the vernacular architecture.

¹ Current PhD research project of the author, "Conservation of the historical built heritage and post-seismic reconstruction activities in

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2. Post-seismic reconstruction experiences and the traditional residential architecture's conservation. Research methodology

The earthquakes studied in the main research have been selected on the basis of some characteristics recognised as especially significant: earthquake intensity, consequences on the affected areas (in terms of impact on both population and existent built heritage), social and institutional response and incentives for the evolution of scientific and cultural debate over the built heritage conservation (and the related intervention methodologies).

After examining the data – presented in table 1 – related to the seismic effects on the anthropic system, the research has been addressed to define a method for analyzing the results of the concurrent reconstruction intervention².

Just as the occurrence of an earthquake produces

widespread effects concerning both the architectural heritage and the social and economical life of entire communities – thus requiring a multi-disciplinary approach – the study of the post-seismic reconstruction processes needs to take into account the influence of the territorial, economic, social and cultural-historical context. In order to face this complexity from the point of view of the built heritage conservation, three areas of study – described below – have been identified to define a basic cognitive framework.

The first field concerns the norms issued to guide the emergency management and to define the intervention strategies for the damaged architectural heritage. This kind of analysis clarifies the reconstruction program's general orientation as well as further essential factors for the definitions of its outcomes, such as the organisation of administrative competences and economic intervention for the reconstruction of private homes.

	Magnitude (Me/Mw)	Macroseismic intensity (MCS)	Affected area (kmq)	Population affected	Number of victims	Displaced people	Depopulation on phenomena	Damaged buildings
Valle del Belice, 1968	6,5	10	1,100 (most affected area)	96,951 *	231	70,000*	12,000	20,600 (in 14 most affected)
Friuli – Venezia Giulia, 1976	6,4	9-10	900 (most affected area)	255,950 *	978	66,000 (52,454) *	-	
Valnerina, 1979	5,9	7			5		-	5,000 (most affected area)
Irpinia, 1980	6,9	10	2,300 (estimated)	870,000 *	2,735	394,000 (219,726) *	32,000	832,578 (whole reconstruction)
Sicilia Orientale, 1990	5,4	7-8			18	10,000	-	7,104 (inagibili)
Umbria – Marche, 1997	5,8	8-9	350 (estimated)		11	32,000		80,000
Abruzzo, 2009	5,9	9-10	600 (estimated)		309	60,000		15,000
Emilia – Romagna, 2012	5,9	7-8			27	19,000		16,000
Centro Italia, 2016	6,6	10-11			333	40,000		200,000 (whole reconstruction)

Table 1. First earthquakes' characterization. The light-blue cells contain data derived directly from the CFTI5Med (online catalogue of strong earthquakes in Italy and in the Mediterranean area). The asterisk states data descending from the same bibliographical reference.

² It is worth clarifying that the generic expression “post-seismic reconstruction” refers, in this context, to the heterogeneous series of strategies and intervention practices realised to overcome the emergency state and relaunch the affected communities' life; therefore it includes, as far as the specific aims

of this contribution are concerned, both the reconstruction of the destroyed structures and the repairing of the damaged ones.

The simultaneous study of the coeval technical standards – with special reference to the intervention techniques on historic masonry buildings – allows us to understand if the operating practices describe an improving process concerning the historical masonry buildings' conservation.

The second field of study refers to an in-depth analysis of the instruments adopted in the aftermath of the seismic event for the description and evaluation of the damage.

The use of survey forms provides a useful general framework for defining the architectural heritage's level of damage and can be considered the basis of the reconstruction program itself, identifying the actions' priority orders. Survey forms were first used in a systematic way during the 1976 earthquake and from that moment on were progressively implemented in their composition and purposes. The analysis of their evolution, with special reference to the sections dedicated to the masonry buildings, can be considered as a mean to read, from another point of view, the different stages which marked out the progression of studies on the traditional buildings' seismic vulnerability.

The last area of study examines the scientific and cultural background within which both the themes addressed in the previous fields were developed.

3. Towns' relocation practices: the earthquake of Belice valley (1968)

The framework of actions taken after the 1968 earthquake showed, since the very beginning of the emergency management, a strategy based on the abandonment of the damaged built heritage: three weeks after the mainshock (on January 14),

Law no.79/68³ provided for the instructions to identify the damaged centres which had to be transferred. The immediacy that distinguished the choices on the delocalisation of the most damaged towns clarified the cultural opinion of a country which, in full building development, identified the new building as the best strategy for the reconstruction needs in a territorial reality, the one of Western Sicily, affected by long years of economic recession⁴. In this sense, the earthquake is supposed to encourage intervention coherent with the building renovation taking place in that period.

Based on this context was the belief of a necessary abandonment – regardless of the level of seismic damage – of the entire Belice Valley's rural towns, made up of traditional buildings believed unhealthy and, after the earthquake, unsafe too. In the year following the seismic event all fourteen towns mostly damaged were subjected to partial or total transfer.

The relocation of towns represents, among the emergency management's strategies, the most extreme action since every possibility of conservation of the existent identity is denied. In this sense, it is quite surprising the Belice Valley's reconstruction appeared to take no account of the cultural orientation defined by the post-war reconstruction programs (RP) which, in fact, represented the legislative basis for the post-seismic ones⁵. As a matter of fact, the RP proposed the recovery and the conservation of the architectural environment as some of the reconstruction's main goals, recognising their role in rebuilding the communities' identity compromised by the devastation of war.

Poggioreale was one of the Belice valley's town to be subjected to total relocation. This case is very representative of practices which were

³ Law no. 79 of 27 February 1968, *Further measures for reconstruction and economic recovery of cities affected by the earthquake in January 1968*.

⁴ Law no. 717 of 26 June 1965, *Regulation on the development measures for the south of Italy*. This regulation aimed at encouraging and facilitating the location and the expansion of

social and productive activities in the southern regions of Italy.

⁵ Law no. 1402 of 27 October 1951, *Amendment to the legislative decree no. 154 of 1 March 1945 on reconstruction plans for towns damaged by the war*⁷ is considered the major post-war reconstruction law.



Fig. 1. The old town of Poggioreale (Source: Macca, 2022).

led by precise development ideas rather than by the actual level of damage; even today, the ancient town of Poggioreale shows a quality of preservation that little corresponds to the description which was provided for the town in the aftermath of the seismic event. If the expression “total destruction”⁶ was indeed exact with reference to other centres subjected to total relocation, it could be hardly considered acceptable for Poggioreale⁷.

As shown in the pictures (Fig. 1) the old town – almost entirely made up of masonry buildings – shows very limited cases of total collapse and although partial collapses on the top of the masonry walls are very widespread, floors are quite often still in place. From the observation of the walls' sections, it is possible to recognise the good quality of the masonry assembly; the presence of a relevant local building expertise is also underlined by a high-level aesthetic value in many architectural elements. So, it might be stated that

the good quality of Poggioreale's local building traditions would have played a role – even a partial one – in the minor level of damage with respect to the other towns of the seismic crater. Representing a place in which time seems to stand still, the old town of Poggioreale represents an absolutely charming location; nevertheless, in the absence of valorisation's perspectives, the historical settlement is destined to progressively disappear. The attempt of repair a bond traumatically interrupted after the relocation practice could ultimately benefit the new Poggioreale too, built three kilometres from the ancient city and today largely uninhabited⁸ and characterised by a poor urban quality.

4. In-place reconstruction and repair of damaged architectural heritage. The Friuli's experience.

Few days after the first major quake on the 6th May, an appeal⁹ by a group of local intellectuals

6 This expression belongs to the report realised by the regional Civile Engineering Office which was assigned of surveys' operations in the damaged town after the earthquake, in M. De Panfilis, L. Marcelli, Il periodo sismico della Sicilia occidentale iniziato il 14 gennaio 1968, “Annali di Geofisica”, 1968, pp. 375-378.

7 Poggioreale, Montevago, Gibellina and Salaparuta were the four towns subjected to total relocation, according to the Decree of the President of the Republic of 30 May 1968, *Total relocation of the town of Montevago, Gibellina, Poggioreale and Salaparuta and partial relocation of S. Margherita di*

Belice, Partanna, Salemi, S. Ninfa and Vita in reliance on the earthquakes of Jenuray 1968.

8 This also descended both from the abandonment caused by the earthquake and some subsequent debatable strategies for the displaced people' temporary accommodation.

9 *Our Manifest*, published on 12 May 1976 on the regional journal “Corriere del Friuli”. The appeal was expressly published so that the “[...] experiences of Belice were not repeated, ceding to trends and interventions unrelated to the identity of places affected by the earthquake [...] and so that architects, engineers [...] contributed with the population to

expressed the common feeling of the local population who, perceiving the reconstruction experience in the Belice valley dangerously close, plainly opposed the relocation practices and proposed, instead, the recovery and the conservation of the existent architectural heritage. To this scope, the subsequent choice of the Italian government to proceed to the reconstruction process through a framework of subsidiarity¹⁰ – thanks to the delegation of most of the administrative procedures to the region – was decisive and promoted a reconstruction model focused on the local realities' will and the popular participation. The reconstruction model in Friuli – Venezia Giulia was outlined as a process based on the faithful reconstruction of what had collapsed and on the anti-seismic restoration of what was damaged: the basic law of reconstruction stated that “the housing requirement [had to be] satisfied through the functional and static recovery of the existing buildings as a matter of priority” and that these intervention had to be implemented “ensuring the valorisation of the remaining historical built heritage to the great extent possible”¹¹.

Buildings belonging to the local masonry construction tradition suffered the greatest damage; in this regard, the technical standards (both the national ones, in force at the time, and those specifically formulated by the Region after the earthquake) on the regulation for repair practices on masonry buildings become even more significant to analyse the reconstruction process.

The national technical standard of reference for the reconstruction in Friuli¹² (Law no. 76/1974) contained some relevant guidelines for the historical built-heritage: actions provided by the previ-

ous standards¹³ for the mitigation of seismic vulnerability in masonry buildings aimed at the removal of those architectural elements recognised – according to the acquired knowledge – as adversely affecting the masonry buildings' structural safety (cantilevered stone stairs, deteriorated wooden ceilings and load-bearing vaults). Thanks to a cultural process which gradually recognised the architectural value that often characterises these elements, Law no. 76/74 provided for a possible derogation on their demolition when it was required by “significant architectural instances”¹⁴. The law rather suggested some technical measures aimed at the removal of the elements' criticalities, such as the use of metal tie-rods to counteract the horizontal thrusts of vaults.

Even more interesting are the technical standards enacted by the region Friuli – Venezia Giulia and formulated by the specially formed Central Interdisciplinary Group (CIG)¹⁵. Among the others, two specific technical documents deserve to be deepened. The technical document no.2 (DT2, Recommendations for masonry buildings' structural repair) was the result of a thorough literature search on repair works carried out up to that point – in Italy and abroad – for masonry buildings; it represented the first collection of technical addresses for structural strengthening of masonry buildings. The technical document no.8 (DT8, Suggestions concerning repair works of buildings with environmental, historical, cultural and ethnic value and related to local architecture) gave a new attention to the safeguard of vernacular architecture, already expressed in the general reconstruction legislation: it underlined that the reconstruction process of Friuli intended to pur-

give Friuli its identity back, respecting the particular urban and architectural fabric that characterized it’.

10 Law no. 546 of 8 August 1977, *Reconstruction of the areas belonging to Friuli-Venezia Giulia and Veneto regions affected by the 1976 earthquake*.

11 Article 1, Regional Law no. 30 of 20 June 1977, *Urgent measures to provide for housing needs of people affected by the earthquakes in May 1976*.

12 Law no. 76 of 2 February 1974, *Construction measures with particular provisions for seismic areas*.

13 Law no. 1684 of 25 November 1962, *Construction measures with particular provisions for seismic areas*.

14 Article 12, law no. 76 of 2 February 1974.

15 The publication of these technical documents was required by the article 8 of the Regional Law no. 30 of 20 June 1977.



Fig. 2. Venzone in the aftermath of the earthquake. The Town Hall and the view of ruins from the medieval walls (Source: <http://www.impegnocivioipervenzone.blogspot.com>, accessed on 23 January 2022).

sue the aims of “[...] economic and social development [...] defending the ethnic and cultural heritage of the population”. This interest in conservation’s themes was even more clear from the presentation – in the premises of the document itself – of the Venice Charter of 1964, identified as a valuable contribution to the statement of universally valid principles for the restoration of traditional masonry architecture.

Some general peculiarities of the technical interventions proposed by the CIG will be described in the following paragraph; what it is now useful to underline is the care given to the realisation, according to state-of-the-art methodologies and techniques, of legislations that tried to align themselves with a clear aim of safeguarding the damaged historic fabrics through the recovery of identity characteristics. The old town of Venzone represented one of the most relevant application’s examples of the Friuli reconstruction model. Declared “National monument of great historical interest” in 1965, it was completely destroyed after the quake of the 6th May (Fig. 2). The historical-critical search which was launched to define the intervention criteria established a design method based on numerous intervention’s strategies: the entirety of roads and public spaces was rebuilt following the exact configuration of the pre-earthquake state while the main monuments and the medieval walls were rebuilt by anastylosis.

With reference to the ordinary buildings, a more complicated intervention method was applied¹⁶, strictly linked to the different features of the local traditional architecture. Thanks to a detailed buildings census, a deepen study of the building types and the analysis of the masonry’s assembly, it was defined a reconstruction process based on the re-building under a regulated scheme (referred to building types and maximum height) and by means of modern building technologies.

5. The cultural debate of the 1980s: new perspectives for the approach to existent buildings

Although the features of technical measures proposed by the CIG can not be specifically addressed in this context, the reference to them is quite significant to introduce the terms of the scientific and cultural debate which took place over the intervention practices for masonry buildings in the eighties and which can be certainly considered at the basis of the actual cultural and technical awareness on the cultural heritage’s seismic protection.

In July 1986 a circular of the Ministry of cultural and environmental heritage, titled “Interventions on monumental buildings in seismic area: recommendations” was published. Although it was specifically conceived for specialised buildings, the

¹⁶ This study was conducted by a working group guided by the architects F. Sartogo and G. Caniggia.

document – expressing overall concepts on the interaction of modern materials and techniques with masonry buildings – was a reference point for considerations on traditional residential buildings, too. The document, known as Ballardini’s circular, was the result of the National Committee for Prevention of Cultural Heritage from the Seismic Risk’s work; the research group was formed in 1984 when it became increasingly manifest how the technical knowledge available in the aftermath of the Friuli earthquake had been inadequate in facing the conservation’s themes within the reconstruction process.

The circular made explicit reference to the practices suggested by the technical documents of CIG – and to the reconstruction’s legislation used after the 1980 earthquake, in Irpinia region, too – underlining a cultural, normative and technical lack of clarity with regard to the use of modern materials for masonry buildings’ repair. The document suggested, instead, the use of “mainly traditional” methods.

The circular was the expression of a cultural background within which the traditional construction techniques were rediscovered and recognised as the starting point for the formulation of interventions consistent with the pre-existence, both from the technical and philological point of view.

The research activities carried out by the National Committee and by particularly sensitive scholars (Edoardo Benvenuto, Salvatore Di Pasquale, Antonino Giuffrè) were addressed to the use of a new study approach on the ancient fabrics’ structural behaviour, “characterised by the complexity proper of masonry buildings, built with materials and methods which change across regions and historical periods”¹⁷. This approach can be recognised at the basis of the realisation of subsequent codes of practice for the historic building fabrics’ conservation, thought

in the nineties, which laid a foundation for technical aids most recently employed to repair buildings damaged by the earthquake.

6. Conclusions

The discreet presence of the state, the transferring of responsibility to Regions, popular participation and the main objective of repair and in-site reconstruction were the features of an organizational model, that of Friuli, to which was made reference in the subsequent reconstruction experiences: the earthquake of 1980 in Irpinia – Basilicata, the one occurred in 1997 in Umbria e Marche regions and the recent earthquake in 2012, in Emilia – Romagna. What we can ultimately underline is how, despite common basic criteria, the diverse reconstruction programs may differ substantially from each other; as an example, the reconstruction model used after the 1980 earthquake, which directly descended from the Friuli’s one, had very poor results in terms of historical fabrics’ conservation. This seems to be strictly linked to the complexity and variety of factors involved in the seismic events and the subsequent reconstruction: it has been underlined the importance assumed by population and intellectuals’ standpoint after the 1976 earthquake. This also means that the modification process to which the different reconstruction models are progressively subjected is not defined by a proper “evolutionary” course; it may show, instead, setbacks and even backward steps from the point of view of the damaged heritage’s conservation. However, it clearly appears that the conservation of cultural heritage, intended as the activity which aims at granting the fruition of future generations, acquires in the post-seismic experiences even more relevant value for the present ones, for its role in the possibility of recovering the sense of identification suspended by the earthquake traumatic experience.

¹⁷ G. Carbonara, introduction to *Linee guida per la valutazione e riduzione del rischio sismico del patrimonio culturale*, coord. Laura Moro. Gangemi Ed., Roma (2006).

In a similar way, the parallel upgrade path of technical standards and cultural standing represents a process still in place.

The post seismic reconstruction of Friuli represents, as well, a turning point for a cultural and technical approach, the actual one, which aims at considering together the history of building construction and the technical expertise.

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