Editors

Alessandro Benetti, Research Fellow, Politecnico di Torino, Department of Architecture and Design (DAD).

Alberto Bologna, Associate Professor of Architectural and Urban Design, Sapienza Università di Roma, Department of Architecture and Design (DiAP).

Josep-Maria Garcia-Fuentes, Associate Professor of Architectural and Urban Design, Politecnico di Milano, Department of Architecture and Urban Studies (DAStU).

Ilaria Giannetti, Associate Professor of Architectural Engineering, Università degli Studi di Roma Tor Vergata, Department of Civil Engineering and Computer Science Engineering (DICII).

Gabriele Neri, Associate Professor of Architectural History, Politecnico di Torino, Department of Architecture and Design (DAD).

Would it be possible to re-examine Italian architecture from 1945 onwards through the lens of *Upcycling and Design for Disassembly* – understanding these as design strategies for reusing existing materials while adding new value, and as critical alternatives to the relentless demand for producing new materials?
This innovative volume identifies and analyses twentieth-century Italian architectural experiences that reveal the continuous adaptation of ancient design and building practices of reuse, which can be considered visionary precedents of today's upcycling trends. In doing so, it challenges the usual view of the twentieth century as the period when the construction industry abandoned millennia-old practices of architectural reuse in favor of a cradle-to-grave model.
The essays and case studies featured in this book examine anachronisms, the endurance of ancient traditions, and pioneering design experiments in Italy and beyond. They uncover the roots, ambiguities, and potential of an architecture of upcycling, and provide a new historiographical, theoretical, and design framework for its understanding.

Mimesis Edizioni
www.mimesisedizioni.it

28,00 euro

9 791222 328546

Upcycling Architecture in Italy since 1945

MIMESIS

Upcycling Architecture in Italy since 1945

Edited by
Alessandro Benetti
Alberto Bologna
Josep-Maria Garcia-Fuentes
Ilaria Giannetti
Gabriele Neri

MIMESIS

This publication is an outcome of the research project *Upcycling Architecture in Italy. Forging and Promoting a Renewed Building Culture*, conducted between 2023 and 2026 by the Politecnico di Torino, the Sapienza Università di Roma, the Università degli Studi di Roma Tor Vergata, and the Politecnico di Milano. The European Union has funded the project through the Next Generation EU program.

Upcycling Architecture in Italy since 1945

Edited by
Alessandro Benetti
Alberto Bologna
Josep-Maria Garcia-Fuentes
Ilaria Giannetti
Gabriele Neri

MIMESIS EDIZIONI

Upcycling Architecture in Italy since 1945

Edited by
Alessandro Benetti
Alberto Bologna
Ilaria Giannetti
Josep-Maria Garcia-Fuentes
Gabriele Neri

Afterword by
Pierre Chabard

With texts by
Paola Altamura, Serena Baiani, Andrew Ballantyne, Alessandro Benetti, Viola Bertini, Alberto Bologna, Nicole De Togni, Danilo Di Donato, Antonella Falzetti, Federico Ferrari, Josep-Maria Garcia-Fuentes, Roberto Germanò, Ilaria Giannetti, Laura Milan, Giulio Minuto, Gabriele Neri, Luca Reale, Jo Rigo, Kevin Santus, Giulia Sergi

Published by
Mimesis Edizioni

Editorial coordination
Alessandro Benetti

Graphic design and layout
Cinzia D'Emidio

Printing and binding
Finished printing in January 2026
by Digital Team – Fano (PU)

ISBN
9791222328546

First edition, January 2026

This book is published as an outcome of the research project "Upcycling Architecture in Italy. Forging and Promoting a Renewed Building Culture," funded by the European Union – Next Generation EU, D.D. n. 1409 of 14/09/2022 (PRIN 2022 PNRR Call), within the framework of the National Recovery and Resilience Plan, Mission 4 Education and Research – Component 2 From Research to Business – Investment 1.1. Project protocol number: P2022KSYY9. CUP Master: E53D23018760001. CUP Politecnico di Torino: E53D23018760001. CUP Università di Roma Tor Vergata: E53D23018770001. CUP Sapienza Università di Roma: B53D23029120001. CUP Politecnico di Milano: D53D23019720001.

It brings together the results of research and critical inquiry carried out during the project and its final scientific event *Upcycling Architecture International Conference* (Politecnico di Torino, 29–30 October 2025).

Upcycling Architecture in Italy

"Upcycling Architecture in Italy Forging and Promoting a Renewed Building Culture"
PRIN 2022 PNRR. Funded by European Union – Next Generation EU.

Politecnico di Torino

Politecnico di Torino

Gabriele Neri (Principal Investigator-Associate Investigator), Associate Professor of Architectural History

Lorenzo Savio, Associate Professor of Architectural Technology

Alessandro Benetti, Research Fellow

TOR VERGATA
UNIVERSITÀ DEGLI STUDI DI ROMA

Università degli Studi di Roma Tor Vergata

Ilaria Giannetti (Associate Investigator), Associate Professor of Architectural Engineering

Antonella Falzetti, Full Professor of Architectural and Urban Design

Giulia Sergi, PhD Student

Dipartimento di Architettura e Progetto
Sapienza Università di Roma

Sapienza Università di Roma

Alberto Bologna (Associate Investigator), Associate Professor of Architectural and Urban Design

Viola Bertini, Associate Professor of Architectural and Urban Design

Roberto Germanò, Research Fellow

POLITECNICO MILANO 1863

Politecnico di Milano

Josep-Maria Garcia-Fuentes (Associate Investigator), Associate Professor of Architectural and Urban Design

Finanziato dall'Unione europea NextGenerationEU

Ministero dell'Università e della Ricerca

Italiadomani

Contents

Introduction

Towards an Architecture of Upcycling?

Alessandro Benetti
Politecnico di Torino

Alberto Bologna
Sapienza Università di Roma

Josep-Maria Garcia-Fuentes
Politecnico di Milano

Ilaria Giannetti
Università degli Studi di Roma Tor Vergata

Gabriele Neri
Politecnico di Torino

This book is the outcome of a two-year research project entitled *Upcycling Architecture in Italy. Forging and Promoting a Renewed Building Culture*, whose main objective is to analyze, articulate, and disseminate the theory and practice of upcycling – understood as a distinctive form of building material reuse – within contemporary historiography and design culture.

Funded by the European Union through the Next Generation EU program within the Italian PRIN 2022 PNRR research scheme, the project has been carried out by four research units: Politecnico di Torino, Sapienza Università di Roma, Università degli Studi di Roma Tor Vergata, and Politecnico di Milano.

More specifically, this volume examines the recent history of Italian architecture since 1945, tracing a trajectory from postwar reconstruction to contemporary design practices through the specific lens of upcycling and the related concept of Design for Disassembly (DfD). The topic and approach of this research entail a series of terminological, chronological, and methodological challenges that must be addressed at the outset in order to frame the discussion that follows.

First and foremost, the very term upcycling – which emerged in the context of post-industrial processes of the 1990s and has become

increasingly common in the fields of circular economy, systemic design, and various strands of design culture – admits multiple definitions and interpretations, particularly when applied to architectural and construction practices. From our standpoint, this flexibility – and, in a sense, its productive ambiguity – offers a remarkable semantic and operational potential. Yet such potential rests on a clear premise: the notion of upcycling as the pursuit of strategies for reusing existing matter as a critical alternative to the relentless production of the new, with the aim, in each case, of generating added value.

This conceptual framing also underpins the chronological scope and methodological approach adopted in this study. Both are closely tied to the operational evolution of industrial culture in the building sector, after the end of World War II in 1945 and throughout the second half of the twentieth century, and to the concurrent abandonment of long-standing practices of material reuse – not only in construction, but across multiple spheres of production.

The attempt to trace practices of reuse – or forms of upcycling and Design for Disassembly *ante litteram* – throughout this period has required both empirical investigation and conceptual reflection. In this process, the remnants of a vanished building culture have intersected – and, in many respects, been challenged by – the logic of industrial assembly and disassembly that, from the avant-gardes through the economic boom and into postmodernity, came to shape the very notion of modern construction.

Here lies both the challenge and the promise of the historiographical reinterpretation proposed in these pages. Situated between *bricolage* and Design for Disassembly, between postmodern *spolia* and the rethinking of industrial design – from everyday objects to the built environment – this study seeks to trace and analyze both the explicit and the latent dimensions of design culture over the past eighty years.

The aim, one might say, is to outline unconventional trajectories from which new insights for alternative historiography and contemporary practice may emerge. This is pursued with due caution toward the various forms of anachronism inevitably produced by the retroactive use of such a neologism, yet with an openness to the productive possibilities it entails. Indeed, the very flexibility of the term – and the discrepancies between its contemporary and historical meanings – make it possible to recognize exploratory approaches in the past, as well as their resonances in the present.

Within this interpretive framework, the main but not exclusive questions guiding this volume – set against a provisional historicization and conceptual examination of upcycling in architecture – may be formulated as follows:

- While the history of twentieth-century architecture has largely been framed through a dichotomy of destruction, reconstruction, and modernity, is it possible to reinterpret it by tracing design and building practices that resonate with what we now define as upcycling and Design for Disassembly (DfD)?

- Can the early postwar period be understood as a pivotal moment of reassessment and renewal of long-standing practices of circularity – bridging the gap between premodern traditions, driven by necessity and scarcity, and the contemporary theoretical framework of reuse-based architecture within a structural condition of material surplus?

- Can we identify pioneering – albeit anachronistic – examples of upcycling within Italian modern and postmodern architecture, in which design practices generate value beyond simple reuse and promote the creation of meaning and quality within a building's circularity? Do these experiences suggest possible directions for advancing current upcycling debates through reflections on *modern spolia*, the practice of conceiving architecture through its elements, and the use of history and memory as design materials?

- Can the second half of the twentieth century – marked by the massive industrialization of the building sector – be examined as a critical juncture in which the concept of optimization first crystallized within construction processes, thereby establishing the foundations for systemic–environmental design and its gradual, if tentative, integration into architectural discourse?

- How might a critical reassessment of the ambitions and failures of building industrialization's unfulfilled potential – particularly its focus on component repertoires and on assembly as a semiotic device (the notion of architecture as opera aperta) – serve as the historical, theoretical, and methodological basis for contemporary DfD and upcycling practices?
- What future trajectories might the Italian construction industry pursue to meaningfully influence contemporary architectural production – moving beyond the mere display of bricolage-based processes and instead establishing upcycling as a systematic, industrialized, and widely adopted design and building practice, as is already occurring in other European contexts such as Denmark, Belgium, and Switzerland?
- How does upcycling relate to processes of heritage-making and preservation, particularly with regard to the controversial heritage status of late twentieth-century industrialized architecture, which is largely characterized by the assembly of building components?

By engaging with these questions, this book seeks to encourage both historiographical and theoretical renewal through a design-oriented lens, with tentative extensions into the field of experimental preservation. First, it contributes to a more nuanced understanding of architectural modernity – one that is neither wholly constructive nor entirely destructive, but inherently multifaceted and ambivalent. Second, it seeks to address a long-standing gap in the historiography of reuse and circularity by tracing their persistence and possible transformations through the years of unprecedented economic growth, mass industrialization, and the early globalization of architectural culture. In this way, the book aligns with a wider scholarly endeavor to reframe the history of the recent past from its peripheries, uncovering episodes and strategies of critique and resistance to hegemonic practices and imaginaries.

What emerges is an original narrative of Italian architecture over the past eight decades, enriched by an openness to recent best practices developed in other European contexts – one that highlights lesser-known experiences and reconsiders familiar cases from a renewed perspective.

This alternative reading of Italian architecture in the second half of the twentieth century tentatively weaves together diverse material histories that are often examined in isolation despite their deep interconnections. These include: the industrial reuse of rubble; assembly-based design processes extended to radical ready-made concepts; the negotiation between tradition and modernity; the use of modern *spolia*; memory and the notion of reversibility in preservation; and the practice of conceiving architecture and design through their components and elements.

In doing so, this volume offers a possible interpretative framework for the current rise of cradle-to-cradle architecture, drawing upon and critically reactivating the legacy of a controversial modernity.

Structure of the Book

The book is structured in five sections. Each section comprises a thematic essay, authored by the section's coordinator, and five case-study sheets focusing on related Italian examples. These sheets have been written by members of the research team as well as by scholars with specific expertise in the selected topics. This collective structure reflects our commitment to making the project a truly collaborative endeavor.

In principle, the five sections follow a chronological order, spanning the entire timeframe of the book and revealing key theories and design practices of reuse and circularity from the mid-1940s to the present. Yet, in tracing precedents and examining their long-term legacies, the chapters often overlap chronologically and resonate thematically. Taken together, they offer multiple, parallel narratives of architectural modernity and interconnected perspectives on a continually evolving landscape.

The first section, devoted to the reuse of rubble, is curated by Alessandro Benetti. It investigates whether – and in what ways – the specific conditions of war, marked by scarcity and urgency, fostered a circular approach to construction that included the salvaging of debris.

The essay traces the trajectories of rubble, understood as displaced material, from its original pre-destruction contexts through the various stages of management to its post-reconstruction destinations.

The discussion begins by outlining the national regulatory framework and the main actors involved. It then examines the types of salvaged rubble and the logistics of its transportation, disposal, and storage. Subsequently, different practices of rubble reuse are identified and classified for both earthworks and building construction sites, ranging from recycling and repair to reuse and, potentially, upcycling. The essay concludes by proposing that World War II constitutes not an isolated phenomenon but part of a much longer history of rubble reuse following catastrophic events – such as earthquakes – a history that continues into the present.

The second section, coordinated by Ilaria Giannetti, questions the alleged novelty of Design for Disassembly (DfD) within design practice and culture. The essay argues that even a cursory examination of the full set of DfD principles – without delving deeply into the history of construction – inevitably recalls, through the rough transposition of the industrial manufacturing approach of *Design for Assembly* (DfA) to the building sector, the theoretical and methodological efforts of the late 1960s to establish a *"component-based architecture"*: the never fully realized apex of construction industrialization.

Building on these premises, the section first explores the micro-histories of building industrialization in Italy between 1945 and 1975, highlighting early approaches to DfD through an analysis of the theoretical frameworks and design experiments underpinning *"component-based architecture."* At the same time, it opens a further perspective on the process of heritage-making of industrialized buildings by proposing an experimental preservation framework grounded in the principles of DfD.

The selected case studies bear witness to the theoretical attempts to integrate industrial culture into architectural discourse between 1945 and 1975, and to the material dimensions of assembly- and disassembly-oriented architectural and technological design that have characterized industrialized construction since the postwar period.

The third section, coordinated by Gabriele Neri, investigates Italian experiences of the 1960s and 1970s that anticipated contemporary practices of architectural upcycling. This was a period marked by profound conceptual transformations and radical oppositions within the architectural field. The essay focuses on eccentric forms of design and architectural thinking that emerged during these pivotal years – situated between the mature reassessment of prewar design culture and a far-reaching critique of the entire architectural system, between the optimism of the economic boom and the social and energy crises of the 1970s.

Among the case studies, the Garelli House, a small Alpine dwelling by Carlo Mollino, is presented as an example of an unconventional negotiation between tradition and modernity – both technical and aesthetic – achieved through processes of dismantling and reinvention. The essay also examines the assemblage of ready-made components available on the market in the functionalist-oriented work of the Castiglioni brothers, within the rapidly evolving field of industrial design. Finally, the third part of the essay reveals multiple strands of thought, research, and practice of reuse that characterized the radical architectural culture of those years.

The fourth section, coordinated by Josep-Maria Garcia-Fuentes, investigates the practice of *modern spolia* and the ways of thinking architecture through its elements in twentieth-century Italy. The country functions as a privileged laboratory for reflecting on contemporary upcycling and on its strong connection to preservation. The essay analyzes the works of Piero Portaluppi, Luigi Caccia Dominioni, and Carlo Scarpa to demonstrate how *spolia* and existing buildings can be upcycled through design authorship, going beyond purely symbolic or ideological purposes. It then addresses the emergence of postmodern concerns with authenticity and historical interpretation, which further raise the question of reversibility, explored in the works of architects such as Marco Dezzi Bardeschi and Francesco Venezia. Finally, by discussing Rem Koolhaas's Biennale exhibition *Elements of Architecture* (2014) alongside his ongoing interest in heritage and preservation, the chapter broadens the connection between *spolia* and architectural

elements, and suggests ways to develop further the current design explorations on upcycling.

To conclude, the fifth and final section by Alberto Bologna reflects on the expressive codes of cradle-to-cradle architecture in contemporary practice. The essay highlights how today's prevailing patchwork aesthetic often risks compromising *firmitas* – constructive integrity – in favor of a merely ornamental *venustas*. It argues that genuine design progress requires salvaged materials to assume a renewed and durable constructive role, which in turn calls for the adoption of design protocols where the DfD approach is conceived as an integral principle. Recognizing the marginal position that Italy still occupies in this regard, the essay presents several recent buildings from Northern and Central Europe as best practices – examples that combine constructive rigor with expressive experimentation. They demonstrate how upcycling can and should evolve into a sophisticated design tool: one that moves beyond the visual idiom of *bricolage* and establishes resource circularity as an intrinsic standard of a responsible built environment, while simultaneously fostering an architecture of high expressive quality.

In line with these ambitions, the volume concludes with an afterword by Pierre Chabard – architect, critic, and historian of architecture and urbanism – who has long engaged with these issues. His contribution expands further the conceptual horizon of upcycling beyond the theoretical and historiographical reconstruction offered in the preceding chapters. By returning to *Usus/Usures* (2010) exhibition curated by Rotor's practice and to the subsequent evolution of his works, Chabard elucidates the theoretical and aesthetic stakes of material reuse as both a methodological shift and a cultural provocation. His reading demonstrates how upcycling – far from being reducible to pragmatic salvage or circular-economy compliance – articulates a profound reorientation in the understanding of architectural time, authorship, and value. In doing so, the text introduces to the Italian architectural milieu a critical and operative perspective that has played a pivotal role, on the European stage, in advancing the intellectual and practical frontiers of design with the existing.

Chabard's essay does more than conclude this book: it reopens it. It invites readers to measure the historiographical insights proposed here against the radical potential of contemporary design practice, and to recognize in upcycling not only a necessary response to planetary urgency, but also a generative aesthetic and disciplinary horizon – one capable of unsettling inherited certainties, reframing material legacies, and envisioning an architecture whose future is inseparable from its past.

Chapter 1

Reconstructing Italy Out of Its Rubble: Reuse Practices During and After WWII (1943–1947)

Alessandro Benetti
Politecnico di Torino

Despite the cultural and tangible relevance of the theme, scholarly research on the rubble left by World War II throughout Italy is surprisingly limited, particularly in the field of architectural and urban history. Existing literature primarily investigates the effects of bombing raids, quantifying and describing casualties and destruction, as well as the reconstruction efforts, focusing both on monument restoration and city planning.[1] By contrast, very little research has been conducted on a crucial intermediate moment, when the rubble of Italian cities was managed, disposed of, and more interestingly salvaged and reused. This is unlike some other European countries, such as Germany and Poland. Over the past decade, German historians, architectural and urban historians, have cast new light on the role of *Trümmerfrauen*, the women in charge of rubble removal,[2] and on the shaping of

1 See: Lorenzo De Stefani and Carlotta Coccoli, eds., *Guerra monumenti ricostruzione. Architetture e centri storici italiani nel secondo conflitto mondiale* (Venice: Marsilio, 2011); Gian Paolo Treccani, ed., *Monumenti alla guerra. Città, danni bellici e ricostruzione nel secondo dopoguerra* (Milan: Franco Angeli, 2008).

2 See: Leonie Treber, *Mythos Trümmerfrauen: von der Trümmerbeseitigung in der Kriegs- und Nachkiegszeit und der Entstehung eines deutschen Erinnerungsortes* (Essen: Klartext, 2014).

Trümmerbergen,[3] that is rubble hills, while their Polish counterparts have focused on the use of rubble for the reconstruction of Warsaw.[4]

This paper overcomes the destruction-reconstruction dichotomy widely adopted by the most established narratives, by analysing the material transformations of Italian cities during the war, and in its aftermath, through the lens of circularity.[5] The term "rubble" is used in a broad sense, as a translation of the Italian word *macerie*: accumulations of material that include both waste and potentially reusable components. Our focus is on the salvaging of the latter through a wide range of practices, from recycling, to repair and reuse, and possibly upcycling. The main research question is whether the specific context of the war, marked by scarcity and urgency, boosted a circular approach to construction. While architectural historians widely agree on wartime being an era of rapid modernization and industrialization of the construction sector, which would serve the following reconstruction phase, can we consider it also as a crucial time of reassessment and renewal of centuries-old practices of circularity – in a sense, bridging the gap between the then-declining pre-modern traditions and later experimentation in the field?

In order to address these questions, the multiple trajectories of rubble are analyzed here, tracing its movement from its original pre-destruction locations, through the various management steps, and finally to its post-reconstruction arrival points. First, the national regulatory framework for rubble management is presented, highlighting the private and public actors involved in the process and their various forms of cooperation. Second, the analysis focuses on the types of salvaged rubble and the logistics of its transportation, disposal, and storage.

3 See: *Hans-Jürgen Mielke, Wald und Politik. Die unendliche Geschichte des Berliner Teufelsberges (Berlin: Projekte-Verlag Cornelius, 2011);* Benedict Anderson, *Buried city, unearthing Teufelsberg: Berlin and its geography of forgetting* (London: Routledge, 2017).

4 See the ongoing research on the topic by Adam Przywara.

5 Amongst the most recent and comprehensive studies framing the notion of circularity, applied to the architectural scale, both from a historical and design perspective, see: IKE Institut Konstruktives Entwerfen et al., *Reuse in Construction: A Compendium of Circular Architecture* (Zurich: Park Books, 2022).

Then, various reuse practices are described, for both earthworks and building construction sites. Two additional specifications narrow the research scope: on the one hand, this paper focuses primarily on rubble lying on public ground, and therefore managed, at least in principle, by public authorities. On the other, unlike several studies in the field of architectural history and restoration, we strive to shed light on the reuse of ordinary construction materials, rather than on fragments and decorations from monuments salvaged for their artistic value.

Three cities were initially selected for this study: Genoa, Milan and Turin, the heavily bombed hubs of Italy's *triangolo industriale* – industrial triangle, the core of the country's industrial production. This paper is primarily based on original research conducted in their Municipal and State Archives. Additional archives from other cities, such as the mid-size Venetian town of Treviso, were consulted to double-check research findings in a broader geographical context. For the same reasons, we also explored the archives of the Allied Control Commission, the military and administrative body established by the Allied powers during and after World War II to oversee the occupation and governance of defeated Axis countries. They provided a comprehensive overview of the liberated parts of Italy. To conclude, archives of architects and private institutions supported the investigation of specific case studies.

Laws and Actors. Rubble Management as a Shared Concern and Opportunity

Italy followed a peculiar, inconsistent trajectory during World War II. At first, the fascist regime aligned with Nazi Germany as part of the Axis powers. However, military failures and growing domestic discontent led to dictator Benito Mussolini's removal in July 1943. Italy signed an armistice with the Allies in September, prompting German occupation in the north and the establishment of the Italian Social Republic, a Nazi puppet state. Meanwhile, the south was liberated by Allied forces, creating a divided nation. May 1945 marked the end of German occupation and Fascist rule in northern Italy and the reunification of the entire country under Allied control, while the Italian

Fig. 1
Bomb damage in Milan. August 1943. © Claudio Emmer, Civico Archivio Fotografico, Comune di Milano.

Fig. 2
Bomb damage in Turin. August 1943. Courtesy Archivio Storico della Città di Torino/Archivio Storico Vigili del Fuoco.

government regained full control of its territories only after the 1946 referendum, which abolished the monarchy and established a republic.

The geographies of bombing reflect this evolving situation and the Allies' shifting priorities. Northern Italian cities such as Genoa, Milan, and Turin were targeted first, in order to disrupt Italy's industrial base and war production. On June 11, 1940, the very first bombs fell on Turin, while raids on the three cities intensified dramatically between October 1942 and September 1943, to continue until the end of the conflict (Figs. 1, 2). Starting from the summer of 1943, bombings accompanied the path of Allied forces from the very South, where the invasion of Sicily started in July 1943, through the central regions and finally back to the North, to exhaust the remaining German and fascist forces. Unprecedented amounts of rubble were produced all through the country by wartime operations, whose management became an ever more urgent matter during the entire conflict. Scattered data exist in this regard and there is no consensus on a specific figure, either among period sources or historians. To give an example, estimates about the city of Milan, one of the most heavily bombed in the entire country, mention that 400,000 m^3 were removed by 1944, while in 1945 2.38 million m^3 still lay on private areas and 1.7 million m^3 on public areas.[6]

In order to cope with this tragic situation, between 1940 and 1945 a few national measures updated the existing legislation on rubble management, for the most part dating back to the end of the nineteenth century and to World War I. The issue of rubble was dealt with in strict connection with other urgent matters, including the reconstruction of public buildings and infrastructures, the housing for displaced people and the compensation of war damages to private parties. The first relevant law in this regard, Law No. 938 of 1940, placed the

6 Sources: "Relazione sull'opera svolta dal Comune per lo sgombero delle macerie" ("Report on the work carried out by the Municipality for the removal of debris"), November 7, 1945. Archivio della Città di Milano, Cittadella degli Archivi, Archivio Storico, Fasc. 81/1954; Agostino Giambelli, *Milano in cinque anni. Sintesi della ricostruzione* (Milan: Massimo, 1951), 20–23.

Ministry of Public Works in charge of all reconstruction activities,[7] but a clearer task division between state and local authorities was defined only as late as 1945, through the *decreti luogotenenziali* (lieutenancy decrees) No. 4 and No. 305.

The former stated that "in each municipality where a significant number of buildings have been damaged by wartime actions, a Building Repairs Committee is established. This committee is composed of the mayor or their delegate, who serves as chair, and two members appointed by the Municipal Council."[8] The Committee "undertakes promotional activities, provides assistance to private individuals, and collaborates with government bodies."[9] Furthermore, "the Ministry of Public Works supervises the Building Repairs Committees […] through officials from the *Genio Civile*."[10] The latter decree, No. 305, promoted a further decentralization of the reconstruction activities, specifying that the Ministry of Public Works had primarily a role of coordination and budget approval, but could delegate all tasks to local authorities. The Ministry of Public Works, its local branch of the *Genio Civile*, the municipalities and their Buildings Repairs Committee – often connected to the *Ufficio Tecnico Comunale* (Municipal Technical Office) – were the main public actors involved in rubble management. Additionally, between 1943 and 1947 a key role was played by the Allied Control Commission, which supported and supervised local government activities.

7 Law No. 938, July 9, 1940, "Interventi di pronto soccorso per la riparazione di opere pubbliche danneggiate in conseguenza di azioni belliche" ("Emergency interventions for the repair of public works damaged as a result of military actions").

8 Luogotenential Legislative Decree No. 4, January 18, 1945, "Norme integrative al decreto legislativo luogotenenziale 17 novembre 1944, n. 366, per il ricovero dei rimasti senza tetto in dipendenza di azioni belliche" ("Supplementary Norms to the Luogotenential Legislative Decree No. 366 of November 17, 1944, for the shelter of those left homeless in dependence of war actions."), Article No. 2.

9 Ibid., Article No. 3.

10 Ibid., Article No. 4.

Both 1945's decrees made explicit reference to rubble removal and reuse, to which they dedicated a specific chapter.[11] Defining rubble as state property, while allowing its transfer to private parties, when necessary, was crucial in steering its trajectories throughout the reconstruction process: "Materials cleared from public areas are considered state property. These materials will be used by the *Genio Civile* for repairs carried out *ex officio*. Additionally, both the *Genio Civile* and the Building Repairs Committees may allocate them to private individuals undertaking repair work independently."[12] Furthermore, the *Genio Civile* was authorized to collect and reuse rubble from private properties, compensating for the negligence of their owners. Historians have noted that "the regulatory framework was imprecise and […] did not allow for the planning of comprehensive, large-scale interventions involving private property."[13]

Genoa, Milan and Turin, all heavily bombed, recurred to an all-in-all standardized form of cooperation between municipal offices and private contractors, framed and allowed by this national legislation. Local public authorities (be it directly the *Genio Civile*, the Building Repairs Committees or some other specifically created sections of the *Ufficio Tecnico Comunale*) outsourced to private contractors both damage assessment in bombed sites and the subsequent rubble removal. The former moment often included the identification of all reusable materials and components; the latter, as a consequence, entailed the sorting of rubble. A part of it was disposed of, in actual dumps or on public ground, as instructed by the municipality; another part, on the contrary, was stocked at municipal warehouses or, sometimes, kept by the contractor as payment for its services.

11 Ibid., chapter "Materiale di ricupero dalle macerie" ("Reuse material from rubble"), Article No. 23–24; Luogotenential Legislative Decree No. 305, June 9, 1945, Chapter VI, "Sgombero macerie ed utilizzazione dei materiali recuperati" ("Rubble removal and use of salvaged materials"), Article No. 57.

12 Ibid., Article No. 23.

13 Samanta Braga, "Lo smaltimento delle macerie nella Milano bombardata: problemi e strategie d'intervento," in *Guerra monumenti ricostruzione*, De Stefani and Coccoli, 327.

Contracts, agreements, and other correspondence between local authorities and private contractors are preserved in the Municipal Archives of both Milan and Turin, documenting the entire process and providing detailed records of quantities, schedules and fees related to rubble management. The possibility of selecting and keeping reusable material was often cited as an alternative form of compensation instead of monetary payment. For example, in Turin, the contract with the Pozzato Felice e Fortunato construction company stated that it was allowed "through its own workers, to sort the rubble to recover used bricks,"[14] and that it "may sell the recovered bricks to private individuals"[15]. Hired contractors sometimes also took in charge the repair of salvaged components, as it was the case for the Musso Francesco building company, whose receipts to Turin's *Genio Civile* also mentioned "the straightening of the metal sheets recovered from various damaged worksites and the repair of radiators, which were also recovered."[16]

In some cases, the collaboration between public and private parties led to more ambitious and coordinated actions. A case in point in this regard is the constitution of the RI-MAT Society, created in 1945 in Milan on the initiative of the *Genio Civile*, the municipal and province authorities, the trade union, the Milanese section of the anti-fascist *Comitato di Liberazione Nazionale* (National Liberation Committee), and the local *Società Umanitaria*. Founded in 1893, the latter remains to present one of the city's leading charitable institutions, aiming at

14 "Schema di convenzione con l'impresa Pozzato Felice e Fortunato per disciplinare lo scarico delle macerie provenienti da cantieri di edifici sinistrati della città di Torino" ("Draft Agreement with the company Pozzato Felice e Fortunato to regulate the disposal of debris from construction sites of damaged buildings in the city of Turin"), March 1, 1944. Archivio Storico Città di Torino, ASCT_ Affari e lavori pubblici_Cartella 875_ Fascicolo 1_1943–1944.

15 Ibid.

16 "Fattura n. 101 della Impresa costruzioni edili stradali Musso Francesco allo Spett. Corpo Reale del *Genio Civile*" ("Receipt n. 101, from the Musso Francesco buildings and roads construction company to the Spett. Corpo Reale del *Genio Civile*"), November 8, 1943. Archivio di Stato di Torino, Serie: Provveditorato alle Opere Pubbliche per il Piemonte e la Valle d'Aosta, Primo versamento, *Genio Civile*, Reparto recupero materiali, Mazzo 4380 "Sgombero di macerie e ricupero materiali."

"providing all citizens concrete assistance through study, education, and work" in order to achieve their "intellectual and moral upliftment."[17] As stated by RI-MAT Society's statute, it was open to membership to "all workers employed in the construction industry,"[18] and was structured as a *cooperativa* (cooperative), meaning that each member paid an entrance fee and purchased a certain number of shares, receiving in return the corresponding portion of the net profit, resulting from the annual balance sheet.

On the one side, the statute laid out the society's scope in clear and pragmatic terms: it was aimed at "the recovery, sorting, and testing of construction materials obtained from demolition or pre-existing rubble,"[19] as well as "the conduct of all resulting subsidiary activities."[20] On the other side, the first public announcement, circulated by the founders to advertise its founding assembly, also testified to an attempt to stir excitement about its practical goals, by framing them within a broader cultural and symbolical narrative (Fig. 3). Many passages of the text lend themselves to this dual level of interpretation:

> There can be no 'reconstruction' of our city without undertaking the systematic demolition of the thousands of remains that clutter the areas to be rebuilt, the stripping and careful sorting of the reclaimed materials, and their placing on the building market at an affordable price. The enjoyment of such reclaimed materials (*il godimento dei materiali ricuperati*) is an indispensable prerequisite to the rehabilitation of buildings still awaiting repair. [21]

17 Source: the Società Umanitaria's website: *umanitaria.it/milano*. For more information on its history, see also Massimo Della Campa, ed., *Il Modello Umanitaria* (Milan: Edizioni Raccolto-Umanitaria, 2003).

18 "Statuto della Società Anonima Cooperativa di demolizione, ricupero e distribuzione dei materiali d'opera" ("Statute of the Cooperative Joint-Stock Company for the Demolition, Recovery and Distribution of Building Materials"), August 20, 1945. ASU – Archivio Società Umanitaria, Fasc. 59/45.

19 Ibid.

20 Ibid.

21 "Prossima costituzione della 'Cooperativa demolizione, ricupero e distribuzione materiali d'opera RI-MAT'" ("Forthcoming Establishment of the 'RI-MAT Cooperative for Demolition, Recovery and Distribution of Building Materials"), August 9, 1945. ACM – Archivio della Città di Milano, Cittadella degli Archivi, Archivio Storico, Fasc. 124/1948.

Logistics. Rubble Travels Across Italian Cities

The enthusiasm of the RI-MAT founders appears to reflect a minority perspective in Italy, where rubble was more often seen as a mere nuisance, something to be disposed of as quickly as possible. This urgency stemmed from several factors: safety, to avoid unstable piles crumbling down; public health, as decaying rubble would rapidly become insalubrious; circulation issues, to restore the normal flows of people and means of transport through the city; and even social issues, as displaced people would find refuge within ruined buildings or rubble piles. Attempts at salvaging and reusing materials happened in the hectic context of what Agostino Giambelli, Milan's Commissioner for Public Works in the immediate postwar period, described as a "rubble fever" ("*febbre delle macerie*").[22]

Giambelli recounts that in 1945

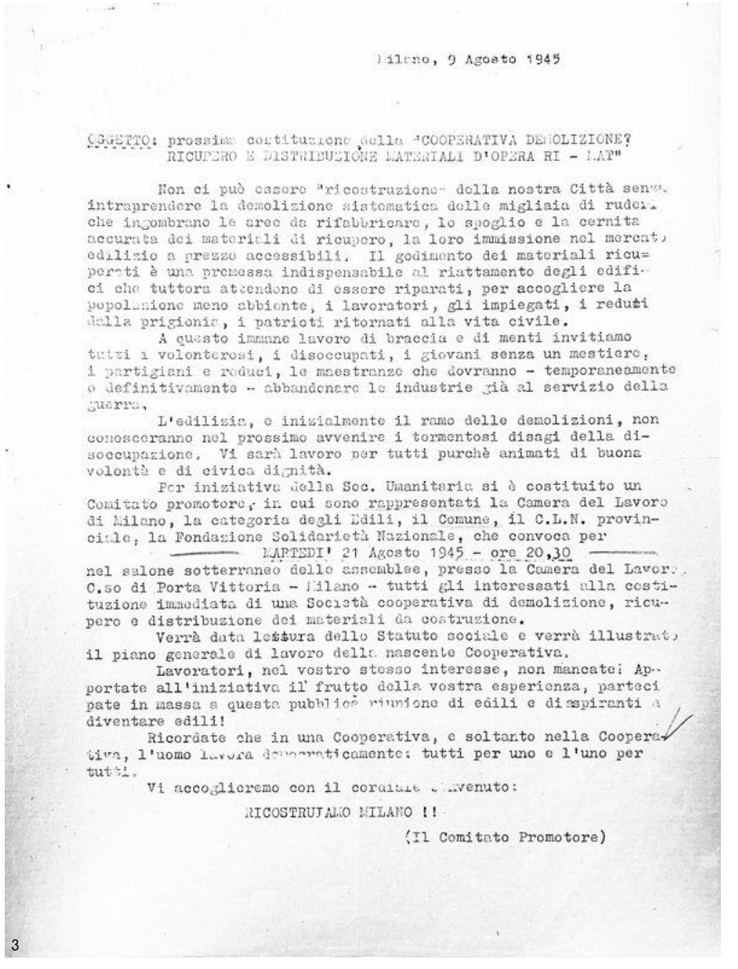
> thousands of workers are about to be mobilized in the enterprise of clearing the rubble. Work begins almost immediately […]. The available means are what they are. There is neither time nor money to impose a technically perfect equipment. Nevertheless, wonders are done. Horse-drawn carts, trucks, picks and shovels, remove and collect the smelly piles from the center to the outskirts. To speed things up, two new '*decauville*' railway are implanted […] on which hundreds of trolleys loaded with soil, crushed bricks, broken stones, shattered furniture and all sorts of objects will parade. It is the old Milan leaving in crumbs.[23]

Giambelli's attitude is boldly anti-nostalgic about rubble of the "old Milan," and goes as far as comparing it to a dirty, repulsive matter collected in "smelly piles." However, in more practical terms, his text also shows the quantity of people and the diversity of means of transport employed for these operations: wheelbarrows, horses, trucks, tramways and *Decauville* railways – narrow-gauge railways made up of prefabricated elements that can be quickly assembled and disassembled (Fig. 4). A rare map from November 1945, preserved at the *Archivio della Città di Milano* (Milan Municipal Archives), provides a comprehensive, spatialized representation of an Italian city crossed by rubble-removal

22 Agostino Giambelli, "La febbre delle macerie," in *Milano in cinque anni*, 17–32.

23 Ibid., 23.

4



Milano, 9 Agosto 1945

OGGETTO: prossima costituzione della "COOPERATIVA DEMOLIZIONE? RICUPERO E DISTRIBUZIONE MATERIALI D'OPERA RI - MAT"

Non ci può essere "ricostruzione" della nostra Città senza intraprendere la demolizione sistematica delle migliaia di ruderi che ingombrano le aree da rifabbricare, lo spoglio e la cernita accurata dei materiali di ricupero, la loro immissione nel mercato edilizio a prezzo accessibili. Il godimento dei materiali ricuperati è una premessa indispensabile al riattamento degli edifici che tuttora attendono di essere riparati, per accogliere la popolazione meno abbiente, i lavoratori, gli impiegati, i reduci dalla prigionia, i patrioti ritornati alla vita civile.

A questo immane lavoro di braccia e di menti invitiamo tutti i volonterosi, i disoccupati, i giovani senza un mestiere, i partigiani e reduci, le maestranze che dovranno - temporaneamente o definitivamente - abbandonare le industrie già al servizio della guerra.

L'edilizia, e inizialmente il ramo delle demolizioni, non conosceranno nel prossimo avvenire i tormentosi disagi della disoccupazione. Vi sarà lavoro per tutti purchè animati di buona volontà e di civica dignità.

Per iniziativa della Soc. Umanitaria si è costituito un Comitato promotore, in cui sono rappresentati la Camera del Lavoro di Milano, la categoria degli Edili, il Comune, il C.L.N. provinciale, la Fondazione Solidarietà Nazionale, che convoca per

SABATO' 21 Agosto 1945 - ore 20,30

nel salone sotterraneo delle assemblee, presso la Camera del Lavoro, C.so di Porta Vittoria - Milano - tutti gli interessati alla costituzione immediata di una Società cooperativa di demolizione, ricupero e distribuzione dei materiali da costruzione.

Verrà data lettura dello Statuto sociale e verrà illustrato il piano generale di lavoro della nascente Cooperativa.

Lavoratori, nel vostro stesso interesse, non mancate: Apportate all'iniziativa il frutto della vostra esperienza, partecipate in massa a questa pubblica riunione di edili e di aspiranti a diventare edili!

Ricordate che in una Cooperativa, e soltanto nella Cooperativa, l'uomo lavora democraticamente: tutti per uno e l'uno per tutti.

Vi accoglieremo con il cordiale benvenuto:

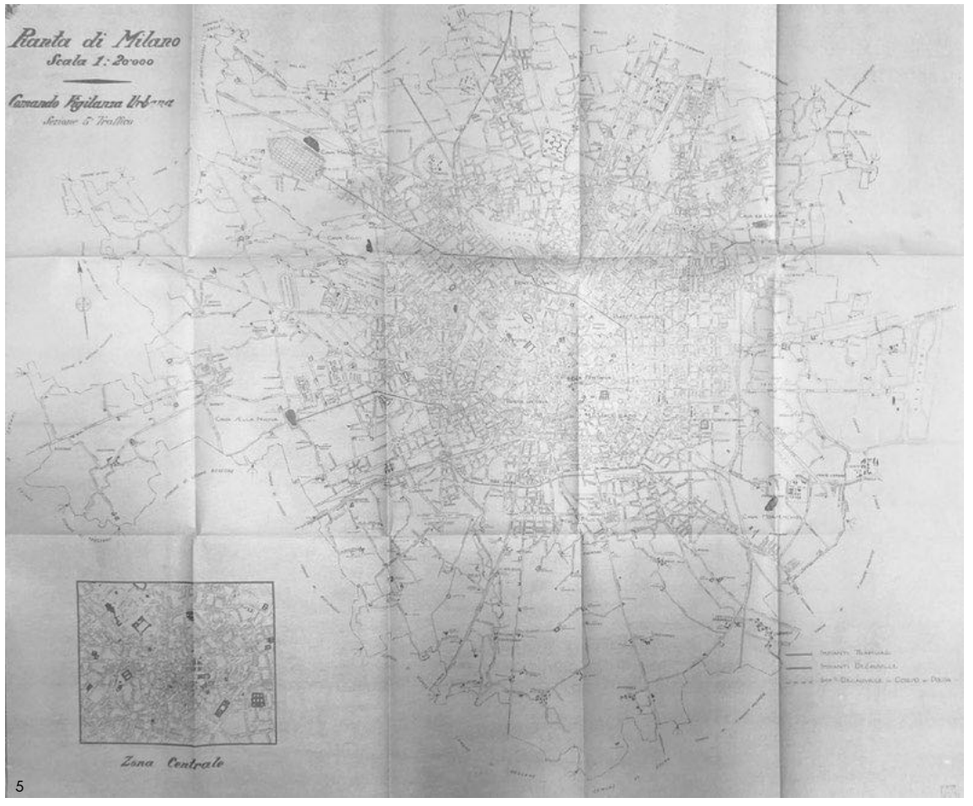
RICOSTRUIAMO MILANO !!

(Il Comitato Promotore)

3

Fig. 3
Public announcement of the founding assembly of the RI-MAT Society. August 9, 1945. Courtesy Cittadella degli Archivi del Comune di Milano, Lavori Pubblici, fasc. 124/1948

Fig. 4
A *decauville* railway in Milan. Circa 1945.



Figs. 5–6
Map of Milan indicating rubble removal infrastructures. November 1945. Full map and detail. Courtesy Cittadella degli Archivi del Comune di Milano, PR Urbanistica, fasc. 81/1954.

infrastructures (Figs. 5, 6). Green lines show temporarily reconverted tramway lines, while orange lines are *decauville* railways built specifically for this purpose. Both lead to the blue spots, disused quarries which are the final destination of disposed-of rubble. This document is a valuable source as it allows, at least in principle to track the exact trajectory of rubble coming from different neighborhoods. It is worth noting that at least one of the quarries highlighted here would become much more than a dump, as we will detail further on.

Among the cities considered here, the *Archivio di Stato di Torino* (Turin State Archives) preserves the most complete documentation for understanding the types and quantities of salvaged rubble, potentially allowing to make a global estimate for the entire Piedmont capital. Three types of standard documents are particularly useful to this aim: first, the reports filled out by private contractors in charge of assessing what can be recovered from each demolition site; second, the invoices issued by public warehouses when receiving shipments from the same contractors; third, the receipts proving the delivery of materials or components kept in the warehouses to private parties. Pieces of furniture and technical elements were most often selected from rubble piles: bathroom fittings such as WC, sinks and bathtubs; pipes and radiators. Architectural components were also recovered, including shutters, doors and window frames, door and window stone surrounds, as are structural elements, such as wooden or steel beams and pillars.

One material, though, stands out from this diversity of salvaged rubble: the recovery of bricks became a priority for the cities of Northern Italy, similarly to other heavily damaged contexts. This is true both for Turin and for Milan. Here, a *delibera podestarile* (chief magistrate's resolution) from August 1944 aimed at boosting the activity of

brick recovery by making it independent from rubble removal.[24] The documents stated that "sorting, cleaning, transport to warehouses, and subsequent possible transport for distribution have taken on an importance for which this management needs to be separated from that of rubble clearing, of which at first brick recovery was a secondary and occasional part."[25] "For economic reasons, also in relation to the scarcity of materials on the market":[26] these are the reasons for financing bricks salvaging stated by at least one spending resolutions approved in this regard by the municipality in 1944.[27] The same year, a contract was established with the Castellano building company.[28]

Two side notes to the core of this research help understand the scale and pace of material circulation through Italian cities at the time. First, while this paper mainly focuses on publicly-owned and publicly-managed rubble, the abovementioned *Società Umanitaria* is a good case in point to cite the existence of entirely privately-managed processes of clearing, sorting and trading of rubble laying on private ground. The society's headquarters, taking up and entire large-scale block in Milan's city center, was ravaged by the August 1943's bombings. Its repair and reconstruction also entailed the selling out of rubble of different types. These included radiators, pipes and other technical components, and more interestingly the entire steel structure of its

24 *Podestà decree* August 24, 1944, "Progetto di ricupero e distribuzione di mattoni usati provenienti dalle macerie di case sinistrate" ("Project for the recovery and distribution of used bricks from the debris of damaged houses"). Archivio di Milano, Cittadella degli Archivi, Archivio storico, Fasc. 116/1949.

25 Ibid.

26 Ibid.

27 "Approvazione spesa di 375.000 £ per il recupero di mattoni da case sinistrate" ("Approval of funding of 375,000 £ for the recovery of bricks from damaged houses"), December 22, 1944. Archivio di Milano, Cittadella degli Archivi, Archivio storico, Fasc. 116/1949.

28 "Contratto con Castellano Stefano per ricupero e distribuzione mattoni usati provenienti dalle macerie di case sinistrate" ("Contract with Stefano Castellano for the recovery and distribution of used bricks from the debris of damaged houses"), June 26, 1944. Archivio di Milano, Cittadella degli Archivi, Archivio storico, Fasc. 64/1949.

Art Nouveau *Teatro del popolo* (People's theatre), destroyed and never replaced.[29] Second, and on a different note, it is worth noting how, in addition to actual rubble, the construction and the dismantling of anti-aerial shelters made available other materials, which are also sometimes recovered, and possibly reused, following a similar path as rubble. These included on the one side sand and gravel from their construction sites, and on the other side the wooden or metal elements rescued at the moment of their disassembly. To cite an example, on October 8, 1945, Milan's *Vice-prefetto vicario* (Deputy Prefect) communicated to the Allied Military Government of Milan City & Province that "from the demolition of school and public shelters in its territory it is possible to recover about 9,000 m^3 of beams and 5,000 m^3 of boards, necessary for reconstruction works."[30]

Reuse Practices, Part 1. Reshaping the Urban Topography

In her seminal text about rubble removal in Milan, architect Samanta Braga points out how "the solution of a practical problem such as the clearing of bombed areas […] becomes in fact a kind of 'meta-building gesture', at the moment when the same rubble is, more or less intentionally, destined for the construction of new parts of the city."[31] In fact, rubble shaped the built landscape of reconstructed Italy in many ways, more or less visible and more or less investigated to date.

The very ground floor of the city was repaired and reshaped through rubble. On the one side, the latter was accumulated in selected locations to repair damaged artefacts, reconstructing what the war destroyed, such as river banks or railway embankments. A case in point are the bridges of Verona, all of them bombed by the Allied forces after some initial hesitation. Their rubble was in part used to repair the adjacent

29 See various documents in this regard kept at ASU – Archivio Società Umanitaria, Pratica n. 75, Anno 1945.

30 "Testing. Demolition of public and school shelters. Recovery of materials." Letter from the Vice prefetto vicario (Deputy Prefect) to the A.M.G. Milan City & Province, October 8, 1945. Archives of the ACC – Allied Control Commission, Milan Province, Public Works & Utilities 360.

31 Braga, *Lo smaltimento delle macerie*, 320.

banks of the Adige river, hit by the same bombing campaign.[32]

In other cases, rubble became the basic material for the realization of future-oriented plans and projects for the city. In Turin, for instance, contractors were instructed by public authorities about where to discharge rubble, that is in correspondence of the new streets' layout defined by the city's *piano regolatore* (masterplan). This was the case, for instance, of via Fossata, in the peripheral Barriera di Milano neighborhood. In 1944, the *Società Anonima Costruzioni Immobiliari di Torino* (Turin Anonymous Real Estate Construction Company) wrote as follows to the local *prefetto* (prefect): "Since the current level of the aforementioned stretch of road is significantly lower than the one established by the *piano regolatore*, the backfill – composed of debris materials such as brick fragments, concrete, and rubble – will provide an excellent roadbed."[33] A plan was attached to the letter, detailing the area where rubble would be discharged, upon authorization.

Rubble was distributed according to the *piano regolatore*'s directions in Milan, too, where it was used for several neighborhoods, thoroughfares and overpasses under construction in the city's outskirts: "The new Lorenteggio district, the area around the new Church of San Giuseppe in Crescenzago, as well as via Vigliani, via Scarampo, via Esquilino, and via Famagosta and the embankments of the future overpasses on via Bonfadini and viale Puglie."[34] The example of the

32 See: "Perizia dei lavori urgenti di demolizione delle strutture in cemento armato crollato in alveo del Ponte Garibaldi sul fiume Adige in Verona" ("Assessment of urgent works for the demolition of collapsed reinforced concrete structures in the riverbed of the Garibaldi Bridge over the Adige River in Verona"), July 1945. ACC – Allied Control Commission, Verona Province, Engineering, 000052/1: Perizie (1945-07), bobina 632E.

33 "Carteggio tra la SACIT – Società Anonima Costruzioni Immobiliari Torino e il Signor Commissario Prefettizio" ("Correspondence between SACIT – Società Anonima Costruzioni Immobiliari Torino and the Prefectural Commissioner"), August 30, 1944. Archivio Storico Città di Torino. ASCT – Affari e lavori pubblici, Cartella 881, fascicolo 6.

34 "Relazione sull'opera svolta dal Comune per lo sgombero delle macerie" ("Report on the work carried out by the Municipality for the removal of debris"), November 7, 1945. Archivio della Città di Milano, Cittadella degli Archivi, Archivio Storico, Fasc. 81/1954.

thoroughfare of via Palmanova, connecting the city center to its North-Eastern outskirts, is particularly significant. In 1946, the city council defined its construction as a priority for three reasons: "In order to relieve the traffic on the congested via Padova […], to use the rubble from the damaged buildings, and finally to give profitable employment to the available workforce."[35] Via Palmanova, though of primary importance, was one of many streets planned by the same *piano regolatore*, and yet the presence of a large amount of rubble in the neighborhood accelerated its realization (Fig. 7).

Reshaping the urban ground floor through rubble was a widespread and long-lasting practice in Italy. As late as 1951, a competition launched by Saint-Gobain for the realization of a new company neighborhood in Pisa, advertised on *Domus*, encouraged participants to consider war rubble as construction material for its earthworks: "For any possible revision, whether general or partial, of the roadways or buildable areas enclosed within the boundary line of the plot […], one could, for instance, make use of the rubble still scattered throughout the city of Pisa for backfilling purposes."[36] Sometimes, the very boundaries of this ground floor were redefined, for instance in relation to water plans. The heavily bombed port of Genoa, Italy's leading hub for both freight and passenger traffic,[37] was reconstructed and extended using large amounts of the city's rubble. In Treviso, rubble was accumulated on the bed and banks of several canals crossing the city, profoundly transforming its waters' geography.[38]

35 "Ratifica della deliberazione presa in via d'urgenza dalla giunta il 14 giugno 1946 per la costruzione del nuovo viale da piazza Sire Raul a Crescenzago" ("Ratification of the resolution urgently adopted by the council on June 14, 1946, for the construction of the new avenue from Piazza Sire Raul to Crescenzago"), July 10, 1946. Archivio di Milano, Cittadella degli Archivi, Archivio storico, Fasc. 171/1950.

36 The competition was advertised on *Domus*, no. 265 (December 1951). See "Un grande concorso per un quartiere a Pisa, per il personale della Saint-Gobain."

37 For historical figures about the port of Genoa through the twentieth century, see: Paolo Arvati, ed., *I numeri e la storia del porto di Genova* (Genoa: Comune di Genova, Unità organizzazione statistica, 2003).

38 This information, considered common knowledge among historians and even the general public, still needs to be double-checked through further research in archives and period sources.

In other cases, rubble helped modelling the reliefs of public parks, as it is the case for the Parco della Pellerina in Turin. Started in 1934, based on the indications of the 1913 *piano regolatore*, its gentle hills hide both the rubble produced by the 1930s opening of via Roma – Turin's main fascist street, cutting through its historic center – and that of World War II bombings. The largest and most well-known Italian rubble hill is certainly Milan's Monte Stella. It is the only one which can compare to its counterparts realized elsewhere in Europe, for instance in Germany, where large-scale *Trümmerbergen* rose in the outskirts of major cities such as Berlin (Teufelsberg) and Stuttgart (Birkenkopf or "Monte Scherbelino")[39] (Fig. 8).

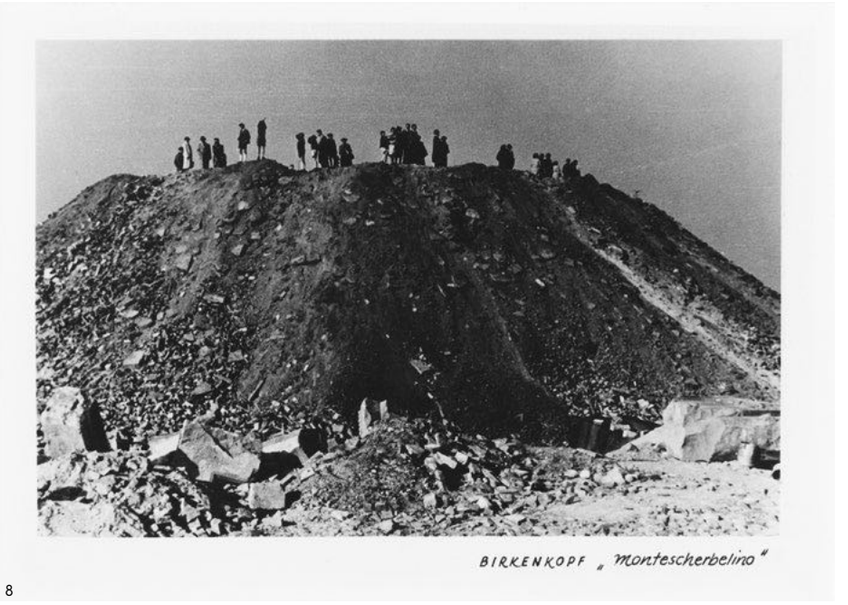
In Milan, local architect Piero Bottoni conceived Monte Stella in 1947 as part of his masterplan for the Quartiere Triennale Ottava (QT8), the low-cost and rationalist-inspired residential neighborhood promoted on the occasion of the Eighth Triennale di Milano.[40] A nearby quarry has originally been intended as the site of a small lake. Once acknowledged that it had been almost entirely filled with rubble from the bombed city center, Bottoni chose to systematize the dumping process and transform the site into an artificial hill (Fig.9). A strategic reuse of rubble not only provided the city with a new, large-scale public park, but it gifted Milanese people with the very first elevated vantage point on their otherwise entirely flat city.

Reuse Practices, Part 2. Repairing and Reconstructing Damaged Buildings

While the salvaging, sorting, and reintegration of fragments and decorations from Italian monuments have been widely discussed

39 See: Mielke, *Wald und Politik.*; Anderson, *Buried city.*

40 About the history of the QT8, see: "Monte Stella al QT8, Milano, 1953–1970 ca.," in *Piero Bottoni. Opera completa*, eds. Giancarlo Consonni, Lodovico Meneghetti and Graziella Tonon (Milan: Fabbri Editori, 1990), 373–375; Graziella Leyla Ciagà and Graziella Tonon, eds., *Le case nella Triennale. Dal parco al QT8* (Milan: Electa, 2005).



8


7

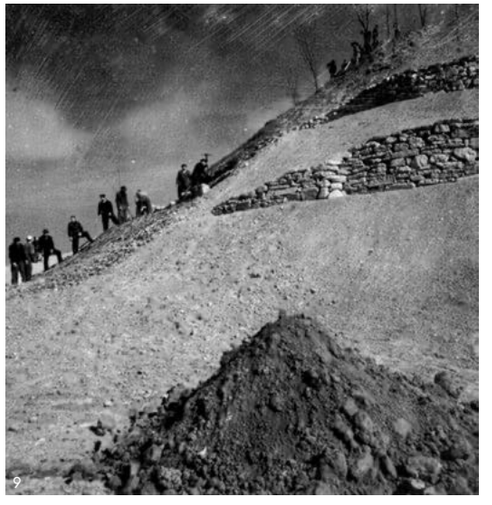

9

Fig. 7
Via Palmanova, Milan. Early 1950s. From the author's personal collection.

Fig. 8
Birkenkopf, or "Monte Scherbelino," Stuttgart. Undated. Courtesy Stadtarchiv Stuttgart - 9200 - F 27826.

Fig. 9
Construction works of Monte Stella, Milan. Undated. Courtesy Archivio Piero Bottoni, DAStU, Politecnico di Milano.

within the fields of the history of restoration and architectural history,[41] more commonplace practices of rubble reuse for buildings' emergency repairs and reconstruction have gone largely unnoticed. However, archival documentation suggests that such practices existed in various forms, ranging from informal or fully illegal actions to officially regulated and documented ones.

Some private citizens spontaneously turned to rubble piles to recover useful elements for repairing their homes, stores and workshops, despite the abovementioned laws establishing the public property of rubble resting on public land. These practices, stimulated by material shortages and critical living conditions, are the hardest to map, because of their informal nature and small scale. Scattered pieces of furniture were also frequently reused within the immediate post-war emergency dwellings. In this regard, the first issue of Ernesto Nathan Rogers's *Domus*, in early 1946, featured a stunningly topical focus entitled "Pronto soccorso" ("First Aid").[42] Its opening page shows a truck crossing the bombed streets of Milan, and bringing back to the city both evacuees and their furniture (Fig. 10). The magazine commissions five architects to come up with inventive solutions to "rebuild one's home with the furniture that could be saved from the bombs, from the wear and tear of moving, from displacement […] to recreate life in a new, more essential and truer setting."[43] Rather than the design of an actual house, each architect is assigned a different case study, inspired by the diverse conditions of evacuees. They are nonetheless required to "adhere as closely as possible to reality,"[44] and provided with the following information: "type of family and number of members; type of dwelling and number of rooms; a certain number of pieces of furniture saved from destruction."[45]

41 See: Carlotta Coccoli, *Monumenti violati. Danni bellici e riparazioni in Italia nel 1943–1945. Il ruolo degli Alleati* (Florence: Nardini Editore, 2016).

42 "Pronto soccorso," *Domus*, no. 205 (January 1946), 6–22.

43 Ibid., 6.

44 Ibid.

45 Ibid.

Informality often slipped into openly illegal conduct. Building owners frequently complained about the theft of their private rubble piles, most often by contractors working on reconstruction sites. The *Archivio di Stato di Torino* preserves documents of several legal disputes in this regard. Correspondence from 1944 between Ms. Anna Barco Marocco and Turin's section of the *Genio Civile* is particularly interesting here because the owner claimed to know the exact places where the rubble, allegedly stolen from her home in corso Quintino Sella 129 by contractor Antonio Acquadro, was reused:

It is known to the undersigned that about 450 tiles were used in the covering of the roof of the Berutti house and still other tiles were used in the Molino house and the Albera house, all adjoining that of the undersigned […]; part of the iron rails (or beams as they may be) were found to be used in constructions of the Perottin house, also adjoining; part of the rails are now lying […] in a farmhouse near Villanova d'Asti.[46]

Some other reuse practices fell under the official legislative framework. As mentioned above, private citizens would turn to municipal warehouses to get specific materials needed for their repair works. On the one hand, receipts found at the *Archivio di Stato di Torino* detail the type and quantity of materials delivered to each person, often times just a few items, documenting thousands of micro-flows of rubble, for which in principle it would be possible to identify a precise final destination. On the other hand, these same receipts include a more general piece of information, namely a standard list of materials, supposedly all those available for purchase: iron railings, shutter rollers, iron rod, scrap iron and sheet metal, roof trusses, window frames, 16 cm and 18 cm steel beams, solid bricks, hollow bricks, and pipes for radiator systems.

The official books of some public buildings testify to the actual reuse of salvaged rubble by the *Genio Civile* and the municipal

46 Letter from Marocco Anna Barco to the *Genio Civile* Office, February 1, 1944. Archivio di Stato di Torino. Serie: Provveditorato alle Opere Pubbliche per il Piemonte e la Valle d'Aosta, Primo versamento, *Genio Civile*, Reparto recupero materiali, Mazzo 4392 "Accertamenti dei materiali recuperabili dalle demolizioni."

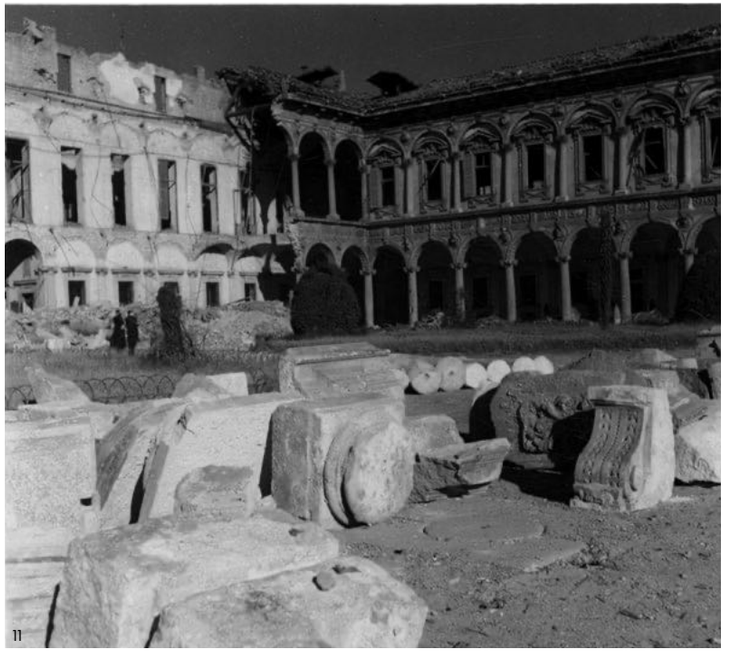


Fig. 10
"Pronto soccorso," in *Domus*, no. 205 (January 1946). Courtesy Archivio Domus – © Editoriale Domus S.p.A.

Fig. 11
Bomb damage at the Ca' Granda, Milan. 1943. © Claudio Emmer, Civico Archivio Fotografico, Comune di Milano.

authorities in charge of emergency repairs. The *Archivio Storico della Città di Treviso* (Treviso Historic Municipal Archive), for instance, keeps record of a number of reconstruction sites within the municipality, including the central market, the town hall and several schools.[47] Both the preliminary reports for damage assessments and the final bills of quantities make explicit reference to second-hand materials. For the town hall, both new and reused bricks were employed, as well as both new and reused wooden beams.[48] For the central market, we learn that the Gasparini Fernando ch. Giuseppe building company accomplished the following tasks, among others:

> 1. Total uncovering of the canopy in the ox market with recovery of the good eternit sheets and removal the eaves with transport on site so as not to leave them unattended; 2. Laying of the eternit sheets from the demolition […] 4. Gutters with salvaged sheet metal, shaped and repositioned in place with associated tie-rods.[49]

While the few drawings included in these folders don't show explicitly their position, they still provide a better understanding of the building's overall shape and suggest their possible distribution.

Treviso was not an isolated case: documents kept at the Allied Control Commission Archives certify that similar reuse practices were implemented in such cities as Verona (for instance for the Liceo Scientifico Fratta),[50] and Orbetello, a smaller village of Tuscany.

47 In this regard, see the following folders from the ACSD – Archivio Comunale Storico Deposito: Lavori Pubblici_51/1; 9.2.B., "Scuole urbane"; 9.2.C., "Edifici scolastici suburbani. Ripristino per danni bellici"; Danni di Guerra_9/9, 1972.

48 In this regard, see the several documents accounting for the town hall's repair works kept at Treviso's Archivio Comunale. See in particular ACSD – Archivio Comunale Storico Deposito_ Lavori Pubblici_51/1.

49 "Polizza n. 7 dei lavori eseguiti per conto dell'ufficio del *Genio Civile* di Treviso = Ripristino della tettoia del mercato suini sita al foro boario" ("Insurance Policy No. 7 for the works carried out on behalf of the *Genio Civile* Office of Treviso = Restoration of the pig market canopy located at the cattle market"). ACSD – Archivio Comunale Storico Deposito, Danni di Guerra_9/9, 1972.

50 "Fabbricato Prov. in via Fratta, sede del R. Liceo Scientifico. Preventivo di spesa per le opere di primo intervento necessarie nell'edificio danneggiato dai bombardamenti" ("Provincial Building on Via Fratta, headquarters of the Royal Scientific High School. Estimate of expenses for the first intervention works needed in the building damaged by bombing"). ACC – Allied Control

The latter is a particularly interesting case, as a rare occurrence of rubble reuse for a publicly-funded residential project. 15 homes "of average kind" were repaired using one third reused bricks and two thirds of new bricks, their floor slabs reconstructed with reused metal beams and their roofs reassembled with two thirds reused tile.[51] It is worth noting that, in all these cases, materials and components were reused in the framework of traditional, low-tech construction processes, following an *ad hoc* approach based on specific needs and on-site availability. Attempts at systematizing rubble reuse in the context of more advanced experimental approaches were extremely rare. A remarkable and little-known exception is Luigi Moretti's 1945 patent for a "Tubular house for extremely rapid and economical construction," which mentions rubble as a potential raw material for its load-bearing structure.[52]

As a coda to this chapter, the examples of some major Italian monuments show how the salvaging and repositioning of fragments and decorations with acknowledged artistic value, on the one side, and the reuse of ordinary construction materials, on the other, often coexisted in the same reconstruction sites. This is the case for the Basilica of Santa Maria dell'Impruneta, a religious complex in the surroundings of Florence dating from the 11th century, whose damaged walls were reconstructed with reused bricks. A technical report kept at the Allied Control Commission Archives states that "for the reconstruction of the damaged wall […], the demolition material may be recovered, either entirely or for the most part, thus enabling the immediate

Commission, Verona Province, Engineering. 000050/1: PERIZIE (1945-06/1945-08), bobina 1231A.

51 "Lavori di riparazione di 15 case del tipo medio facilmente riparabili nell'abitato di Orbetello," ("Repair works on 15 medium-type houses easily repairable in the town of Orbetello"). ACC – Allied Control Commission, 001042/1: 15 HOUSES AT ORBETELLO (1944-00/1945-00), GRO.71 – bobina 205E, Grosseto.

52 Luigi Moretti "Casa tubolare di rapidissima ed economica costruzione," patent n. 413222, filed in Rome on 08/11/1945, registered on 05/04/1946 (Archivio Centrale dello Stato, Fondo Ufficio Italiano Brevetti e Marchi).

Fig. 12
Alberto Burri, Cretto, Gibellina (1984-2015). © Davide di Mauro/ wikicommons

commencement of works without significant delay."[53] In Milan, a case in point is the ancient Ca' Granda, a former hospital under renovation since 1939 to host the city's *Università Statale* (State University). After their bombing, both the fifteenth-century Sforza courtyards and the seventeenth-century Richini courtyard were reconstructed, starting from 1949, using the method of anastylosis, that is reassembling original architectural fragments found on site[54] (Fig. 11).

Accomplishments and Disavowed Promises of Rubble Reuse in Italy

Rubble piles served as a significant source of construction material in Italy during and after World War II. Both formally and informally, in ordinary as well as unique ways, they were repurposed within landscapes, infrastructures, and buildings. The cases described here

53 "Perizia relativa al ripristino della Basilica di Santa Maria dell'Impruneta" ("Assessment report on the restoration of the Basilica of Santa Maria dell'Impruneta"). ACC – Allied Control Commission, 10800 / Region n° 8, Toscana, 145, "Monuments and Fine Arts (and Archives)," 66, "Superintendenza Florence, Arezzo, Pistoia."

54 See: Maria Antonietta Crippa and Emanuela Sorbo, *Liliana Grassi. Il restauro e il recupero creativo della memoria storica* (Rome: Bonsignori, 2007).

compose a vast and multifaceted mosaic of reuse practices, both rooted in long-standing traditions, and anticipating later experiments. They can be described and classified through some key notions from the contemporary discourse on these topics: they include recycling, as seen in the use of rubble for the roadbeds of Milan's and Turin's new thoroughfares and neighborhoods; the repair of salvaged components and their storage within municipal and private contractors' warehouses; the reuse of materials (bricks, in particular), along with other components and technical elements for the emergency repairs and reconstruction of public and private buildings. The Milanese rubble-made Monte Stella, which enriched the otherwise entirely flat city with its only hilly and panoramic public park may be considered an *ante-litteram* case of full-fledged upcycling, adding new value both to its material and to the city as a whole.

Far from being an isolated case, these practices form part of a broader history of rubble reuse in twentieth-century Italy, one that is only recently starting to attract the attention of architectural historians. Early examples of this include the state-coordinated repurposing of construction materials, salvaged from the fascist demolitions in Rome's ancient center, for the realisation of low-cost housing for displaced people in the *borgate* – working-class, often informal settlements in the city's outskirts.[55] In the second half of the century, a few post-earthquake reconstructions became the occasion to implement innovative strategies of rubble reuse, combining symbolical and practical instances. Alberto Burri's *Cretto* (1984–1989) in Gibellina, a village razed by the 1968 Belice Valley earthquake, is possibly the country's most impressive and well-known rubble artwork (Fig. 12). While the village was reconstructed *ex-nihilo* in a new location, its remnants were compacted *in situ* following the boundaries of its former blocks, to evoke the presence of what had been lost.[56] A few kilometers away, Alvaro Siza intervened almost simultaneously on the ruined village of Salemi's *Chiesa Madre*, main

55 See the ongoing research on the topic by Anna Mascorella.

56 See: Massimo Recalcati, *Alberto Burri: il Grande Cretto di Gibellina* (Arezzo: Magonza, 2018).

Fig. 13
Chiesa di Santo Stefano, Salemi.
© Orazio Saluci.

Fig. 14
One of the storage areas for the stones of the Duomo di Venzone, recovered after the collapse.
© Francesco Doglioni.

square and adjacent streets. He reorganised decorations and rubble creatively, in order to provide new meanings and new functions to the public spaces of a nearly lifeless place[57] (Fig. 13). In the words of Roberto Collovà, who collaborated with Siza on the project: "The notion of intervening within the area through a utilitarian and meaningful redistribution of materials is particularly compelling – envisioning a perpetual construction site where both building and dismantling are conceived as integral parts of the design process."[58] In Venzone, completely destroyed by the 1976 Friuli earthquake, Francesco Doglioni promoted an unprecedented reconstruction through anastylosis not just of the monumental Duomo, but of large parts of the historic fabric, whose stones were selected from rubble piles, stored and virtually replaced in their exact position[59] (Fig. 14). In more recent years, the reconstruction phases following the 2009 L'Aquila earthquake and the 2016–2017 Amatrice earthquakes prompted a broader, if not thriving, debate about rubble reuse, also questioning its legislative framework.[60] *Casa Futuro*, an ongoing project by Stefano Boeri Architetti for the Don Minozzi community center in Amatrice, is one of very few reconstruction sites actually making large use of rubble – almost 60% of that resulted from the pre-existing building, as declared by its architect.[61]

Amongst all these destructive events, World War II and its aftermath certainly stand out in terms of quantity of available rubble and

57 See: Alessandro Benetti, "Siza e Collovà a Salemi. La memoria di uno spazio pubblico," in eds. Bruna Di Palma and Fabrizio Toppetti, *Alvaro Siza. Premio Argan 2022* (Gubbio: ANCSA, 2023), 44–49.

58 Roberto Collovà, "Belice 1968. Un'avventura siciliana," in *Ricostruzioni. Architettura, città, paesaggio nell'epoca delle distruzioni* (Milan: La Triennale di Milano, 2019), 79.

59 See: Francesco Doglioni, "Friuli 1976. Venzone dov'era com'era," in *Ricostruzioni. Architettura, città, paesaggio*, 83–91; Corrado Azzolini and Giovanni Carbonara, eds., *Ricostruire la memoria. Il patrimonio culturale del Friuli a quarant'anni dal terremoto* (Udine: Forum Editrice, 2016).

60 See: Filippo Angelucci, Cristiana Cellucci, Michele Di Sivo and Daniele Ladiana, "Per un archivio dei materiali da demolizione nei territori della ricostruzione," *Techne – Journal of Technology for Architecture and Environment*, no. 16 (2018), 60–67.

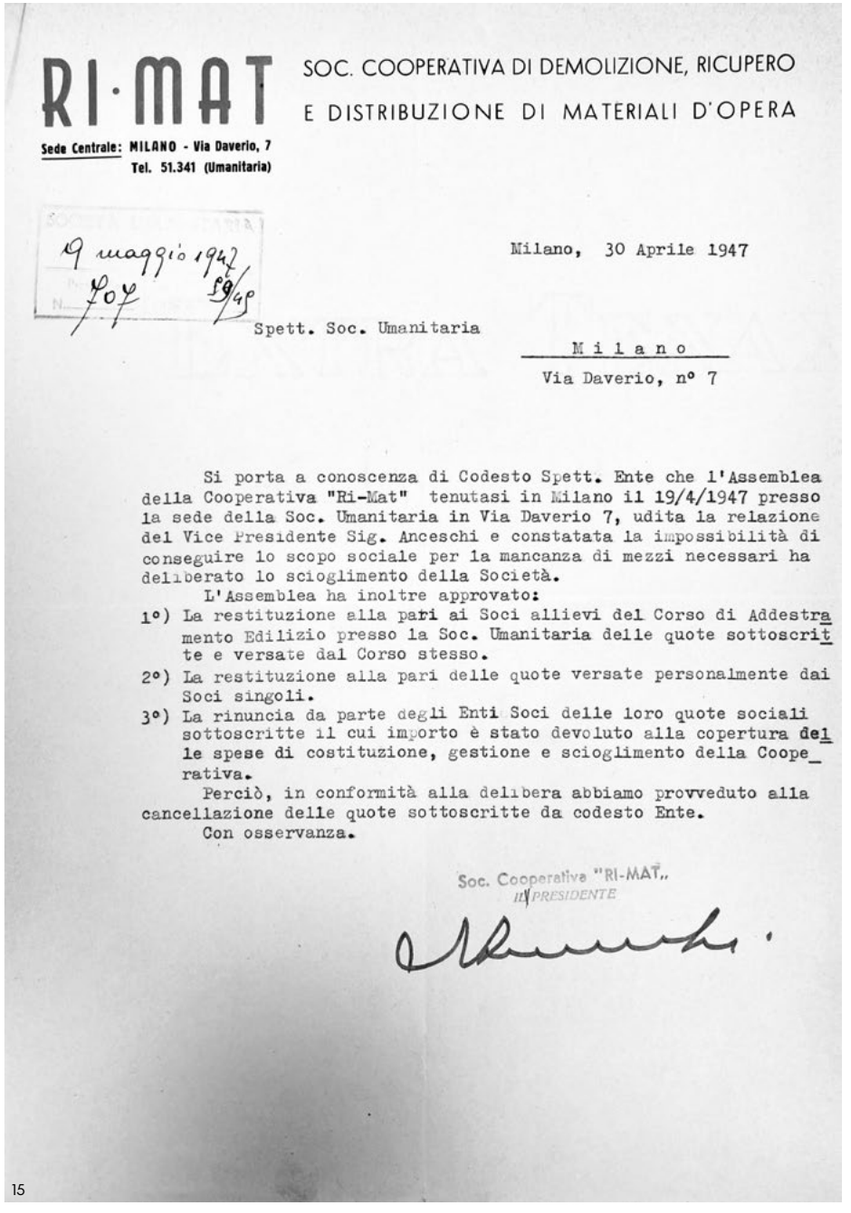
61 See the official website of Stefano Boeri Architetti: stefanoboeriarchitetti.net. https://www.stefanoboeriarchitetti.net/project/casa-del-futuro/.

of diversity of its reuse practices. This doesn't mean, though, that these practices became paramount at the time, either in practical or in cultural terms. Despite the numerous findings shown in this paper, the limited quantity and the inconsistent quality of available archival documentation reflect the absence of an organic institutional, legal and administrative framework, and the consequent lack of coordinated actions. The case of Genoa is particularly striking: the city State and Municipal Archives preserve no information regarding the use of rubble for the harbor's post war reconstruction and extension, which on the other hand, seems to be common knowledge, among historians and even the general public. The same goes for Treviso and its canals, suggesting in both cases the existence of informal processes, rather than an actual publicly-led plan. Another case in point is the abovementioned RI-MAT Society: despite its founders' initial enthusiasm, no record of its actual functioning is preserved either at the *Società Umanitaria* or at Milan Municipal Archives. Its dissolution document from April 19, 1947 confirms its lack of effectiveness, stating "the impossibility of achieving the organization's purpose due to the lack of necessary means"[62] (Fig. 15). Furthermore, the advancement report on the activity of rubble removal commissioned by the *Sezione macerie* (Rubble section) of Milan's *Ufficio Tecnico Comunale* is unequivocal in confirming that "initiatives for the actual utilization of rubble, such as the very interesting one already deployed at a central brick-forming site, have hardly developed, despite several negotiations initiated with private parties."[63]

This reality lends itself to a twofold interpretation. In practical terms, Italy's complicated political situation in the mid-1940s, with weak state authorities and unclear division of tasks, prevented the implementation of a centralized, comprehensive process. This is a key reason why, despite some early attempts, rubble reuse never turned

62 Letter from the RI-MAT to the Società Umanitaria, April 30, 1947. ASU – Archivio Società Umanitaria, fasc. 59/45.

63 "Relazione sull'opera svolta dal Comune per lo sgombero delle macerie" ("Report on the work carried out by the Municipality for the removal of debris"), November 7, 1945. Archivio della Città di Milano, Cittadella degli Archivi, Archivio Storico, Fasc. 81/1954.



RI·MAT SOC. COOPERATIVA DI DEMOLIZIONE, RICUPERO E DISTRIBUZIONE DI MATERIALI D'OPERA

Sede Centrale: MILANO - Via Daverio, 7
Tel. 51.341 (Umanitaria)

9 maggio 1947
Fol 59/49

Milano, 30 Aprile 1947

Spett. Soc. Umanitaria
Milano
Via Daverio, nº 7

Si porta a conoscenza di Codesto Spett. Ente che l'Assemblea della Cooperativa "Ri-Mat" tenutasi in Milano il 19/4/1947 presso la sede della Soc. Umanitaria in Via Daverio 7, udita la relazione del Vice Presidente Sig. Anceschi e constatata la impossibilità di conseguire lo scopo sociale per la mancanza di mezzi necessari ha deliberato lo scioglimento della Società.

L'Assemblea ha inoltre approvato:

1°) La restituzione alla pari ai Soci allievi del Corso di Addestramento Edilizio presso la Soc. Umanitaria delle quote sottoscritte e versate dal Corso stesso.

2°) La restituzione alla pari delle quote versate personalmente dai Soci singoli.

3°) La rinuncia da parte degli Enti Soci delle loro quote sociali sottoscritte il cui importo è stato devoluto alla copertura delle spese di costituzione, gestione e scioglimento della Cooperativa.

Perciò, in conformità alla delibera abbiamo provveduto alla cancellazione delle quote sottoscritte da codesto Ente.

Con osservanza.

Soc. Cooperativa "RI-MAT"
IL PRESIDENTE

15

Fig. 15
Dissolution document of the RI-MAT Society. April 19, 1947. Courtesy ASU – Archivio Storico Umanitaria (Milano), busta 59/1945.

into a paramount, official, publicly promoted and publicly led strategy for the reconstruction of Italian cities, but it was not the only one. The poverty of the cultural debate on these topics is striking, as it was almost entirely overlooked by the specialized and general press, academic and public conferences, and printed publications of various kinds. Just to cite a few examples, very little space was devoted to rubble management and reuse at the *Primo convegno nazionale per la ricostruzione edilizia* (First National Conference on the Reconstruction), held in Milan on December 14–16, 1945.[64] The same year, prominent Milanese engineer Pietro Giulio Bosisio published the topical essay *Ripristino delle case sinistrate* (Repair of damaged houses).[65] Bosisio very pragmatically stated that, in a condition of acute scarcity, "the materials to be used for the repairs, at least in the initial phase – which may be prolonged – should be limited to those readily available on site or in nearby areas,"[66] but he didn't cite rubble reuse as an option. The analysis of this published sources adds to the scattered archival documentation in supporting a more symbolic reading of the rapid erasure of rubble from Italy's political, economic and cultural horizon. While Germany romanticized the role of its *Trümmerfrauen* as a symbol of national reconciliation – a myth questioned by some recent studies in the field of history[67] –, Italy seems to have been more impatient to dispose of its rubble, both materially and rhetorically. Giambelli's account of the "smelly piles" filling the streets of Milan suggests a perception of rubble as dirt, rubble as "matter out of place," borrowing anthropologist Mary Douglas's definition,[68] which certainly deserves further investigation.

Consistent with these premises, a large part of consolidated architecture and construction histories omit any references to rubble

64 See *Rassegna del primo convegno nazionale per la ricostruzione edilizia* (Milan: Officina grafica Marinoni, 1945).

65 Ing. Pietro Giulio Bosisio, *Ripristino delle case sinistrate* (Milan: Edizioni Vesta, 1945).

66 Ibid., 7.

67 See: Treber, *Mythos Trümmerfrauen*.

68 See Mary Douglas, *Purity and Danger. An Analysis of the Concepts of Pollution and Taboo* (London–New York: Routledge, 1992, first published in 1966).

reuse practices. Instead, they highlight the rapid transition from an emergency reconstruction phase to a new era of growth, production and consumption, leading to the country's so-called "economic boom" as soon as the late 1950s. This corresponded to two main trends in building practices: some attempts at industrialization on the one hand, though more marginal than in other countries such as France; and, on the other hand, the continuation of low-specialization, artisan construction models. This paper is a first attempt at filling this historiographic gap, accounting for the numerous, though undoubtedly minority, rubble reuse practices of 1940s Italy. It unveils some overlooked cases, but has to cope with the scarcity of both primary and secondary sources. Several documents reporting informal or illegal transfers of rubble suggest a possible way to overcome this difficulty. They encourage us to turn to the field of "architecture without architects," *à la* Bernard Rudofsky,[69] of "do-it-yourself" constructions practices, for which rubble reuse might have been crucial. A different methodology, possibly including an "archaeological" approach to the built environment, and a different set of sources would be required for what might be the next step in this study.

69 Bernard Rudofsky, *Architecture Without Architects. A Short Introduction to Non-Pedigreed Architecture* (New York: MoMA, 1964). Catalogue of the exhibition held at the MoMA, New York, 11 November 1964–7 February 1965.