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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.

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Upcycling Architecture in Italy since 1945

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Edited by
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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.

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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"
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Heritage, Harvesting and Superuse

Paola Altamura
Serena Baiani
Sapienza Università di Roma

Since the early 2000s, the Dutch group Superuse Studios has developed a methodology for scouting waste materials suitable for architecture (e.g., by-products, remnants, defective products, surplus, construction waste, etc.) within a 25 km radius of intervention sites. This enables "harvesting" waste materials to feed a Harvest Map showing available sources for *superuse*, a design approach that looks for discarded materials and reads their reuse potential, transforming their characteristics into added value for new products or buildings. *Superuse* parallels reuse, as *upcycling* does with recycling, with upcycling intended – like in *Cradle to Cradle* – as a practice of recycling materials in such a way as to maintain and/or accrue their value over time. The Harvest Map serves as a design premise and open-source resource for multiple designers, encouraging experimentation with industrial waste to develop new design approaches while enhancing local waste from the urban mine. This approach aims at reducing embodied energy in materials, raw material consumption and emissions from producing/transporting "new" materials, while activating small-scale circular economy processes. On-site material harvesting, done before design choices, strongly impacts the project ensuring efficient resource use and challenging conventional design processes, where material selection typically follows rather than informs design conception.

The Villa Maggiore project (2017-2019) on Lake Como, coordinated by architect Césare Peeren (Superuse On Site), aimed to experiment with this approach in the Italian context. The project involved renovating and re-functionalizing a 1920s heritage-listed villa into a zero-energy holiday home. A Harvest Map was developed for the Como-Milan area – including the important Brianza Furniture District – by a multidisciplinary team coordinated by Césare Peeren with Paola Altamura (researcher) and Elisa Saturno (designer) to identify waste materials from local companies suitable for the villa's renovation. The 450 square meters three-story building features load-bearing stone masonry, wooden floors, and one unfinished floor. After years of abandonment, the villa underwent renovation with minimal remodeling (e.g., transparent protective coatings on concrete and wooden surfaces, bathrooms upgrades, installation of double glazing in restored timber windows, second-floor ceiling insulation) and passive/zero-energy systems (masonry mass for cooling, central stairwell for natural ventilation, ground pipes delivering constant 14°C air, original shutters for shading, internal curtains for insulation, solar-powered air-water heat exchangers for hot water and heating), all based on superused locally harvested materials.

During the harvesting phase, preliminary geographical desk research and site visits were conducted to identify local companies holding waste resources not reintegrated into production cycles (scouting phase). A database of available materials was created (indicating nature, typology, dimensions, production frequency, price): over 130 materials/products were identified, mapped and sampled, potentially usable for furniture design and villa refurbishment, then inserted into the geo-referenced Harvest Map database to connect suppliers with potentially designers interested. The project enabled, through collaboration between Superuse Studios and Giacimenti Urbani, the opening of the Italian page of the open-source *Oogstkaart* portal, launched in March 2018 at Milan's *Fa' la cosa giusta* fair. Subsequent projects, including Williams Bar in Milan and exhibition stands, successfully used materials

Fig. 1
Superuse On Site, Villa Maggiore, Como, Italy, 2017–2019. Detail of furniture in superused timber elements under construction. © Paola Altamura, 2018.

Fig. 2
Superuse On Site, Villa Maggiore, Como, Italy, 2017–2019. Detail of bed in superused timber boards and shutters, hung from the existing unfinished timber floor, in the Melbourne room, immediately after completion of works, by Refunc. © Denis Guzzo, 2018.

Fig. 3
Superuse On Site, Villa Maggiore, Como, Italy, 2017–2019. Detail of bed in superused metal profiles, timber shutters and laminated panels, in the Wien room, immediately after completion of works, by Superuse On Site. © Denis Guzzo, 2018.

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sourced through Villa Maggiore's workshop.
Among identified waste materials/products, 22 were *superused* at Villa Maggiore as integrative layers of the existing envelope (insulation, flooring, finishes) or as components for interior and exterior space furnishing, including: textile production waste (textile selvedges and defective silk); metal sheets derived as by-products from automotive laser cutting; leftover sandwich panels in metal and wood; a disused textile machine composed of high-resistance metal profiles; leftover pots of resin for interior surface treatment; fire extinguishers, metal trolleys, nozzles and brackets, foam panels, luminous signs. Material procurement coordination involved direct relationships with waste-producing companies to define procedural and economic supply aspects.
The villa's interior transformation occurred through two intensive two-weeks collaborative workshops, where four international teams (Superuse, Co2RO, Studio Cifra and Refunc) including fourteen designers, lived and worked on-site as designers-in-residence, producing custom-built furniture for seven bedrooms, storage spaces, lighting, dining areas and lounge facilities with *superused* materials such as: neoprene scraps as acoustic floor insulation, topped with reused exhibition flooring; leftover Malta pots (a resin-like material made from industrial waste like coal grains from filter systems, free from VOCs and CO_2 emissions) applied experimentally in bathrooms, kitchens and floor finishing using a mixed-color technique; metal sheets from automotive laser cutting processes repurposed for furniture as well as to build the garden fence and the pillars of a new pergola supporting solar panels.
The Villa Maggiore project demonstrates how circular design requires fundamental shifts in design methodology and value chain collaboration and establishes a replicable model to reduce environmental impacts and create added value from waste streams while preserving cultural heritage.

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Fig. 4
Superuse On Site, Villa Maggiore, Como, Italy, 2017–2019. Detail of the ground floor living room with floor finishing in superused waste resin and Firehosescape furniture by Co2RO. © Denis Guzzo, 2018.

Fig. 5
Superuse On Site, Villa Maggiore, Como, Italy, 2017–2019. Detail of one of the bathrooms with floor and walls finishing in superused waste resin. © Denis Guzzo, 2018.

Fig. 6
Superuse On Site, Villa Maggiore, Como, Italy, 2017–2019. Detail of storage cupboard by Studio Cifra. © Denis Guzzo, 2018.

ARCò Architecture and Cooperation Casa Chiaravalle, Milan (2018)

Earthbags and Earthship: a Manifesto Building

Paola Altamura
Serena Baiani
Sapienza Università di Roma


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ARCò Architettura e Cooperazione is a cooperative, founded in 2012 by a group of architects and engineers based on a design approach that combines social, economic, and environmental sustainability. A specific aspect is the choice to adopt the most appropriate techniques for the site, using waste, natural and recycled materials, in order to guarantee construction processes managed directly by the communities involved. This approach has allowed the team to address and resolve the various problems posed by the humanitarian emergency in international contexts.

The "Design and Build with Ø km (local and recycled materials)" project, developed in 2018 over a four-week period as part of the sixth workshop co-funded by the European Erasmus+ LearnBIØN (Learn Building Impact Zero Network, 2015-2018), was organized at Casa Chiaravalle, in Milan's Parco Sud, a farmhouse confiscated from organized crime and managed since 2016 by five social cooperatives.

The team involved students, migrants, NEETs, unemployed individuals, architects and engineers, coordinated by ARCò, in a four-week training and application program that redeveloped an area within the complex using alternative and low-cost construction techniques to create a small multifunctional building (wooden structure with a depth of 5 meters and a height of 2.50 meters), serving as a gathering and meeting place for the local community, with bioclimatic functionality. Despite the suboptimal exposure, a transparent facade was built for winter heating; openings were placed on all facades to enable cross ventilation in summer, while thermal insulation was provided by Earthbags.

With the objective of responsible use of natural and unconventional resources, the project focused on reusing wooden window frames, bottles, plexiglass panels and pallets, combined with Earthship and Earthbags, seeking appropriate technologies with reduced processing, installation and transport times and low environmental and economic costs. The attention to "Ø km" and the use of local and recovered materials also aimed to enhance local traditions and architectural culture and to identify techniques that required low-level technological processing and minimal transport.

The development of the workshop modules, for the construction of a "manifesto building," trained the team in various construction techniques: the first, Earthbags, involved building with earthbags, a technique that uses sturdy bags filled with organic material, locally sourced earth. The system ensures

Fig. 1
ARCò, Casa Chiaravalle, Milan, Italy, 2018. Main facade composed of reclaimed timber windows. © ARCò, 2018.

Fig. 2
ARCò, Casa Chiaravalle, Milan, Italy, 2018. Earthbags envelope. © ARCò, 2018.

Fig. 3
ARCò, Casa Chiaravalle, Milan, Italy, 2018. Detail of the Earthship wall incorporating reused bottles. © ARCò, 2018.

Fig. 4
ARCò, Casa Chiaravalle, Milan, Italy, 2018. Assembly of reclaimed timber windows in the main facade, acting as a passive heat gain system. © ARCò, 2018.

structural stability by anchoring one or two strands of four-point barbed wire between each row of bags to join the bags together and prevent the walls from coming apart (resistance to fire, flooding, and earthquakes). It also promotes an optimal microclimate for the thermal inertia of the soil and offers excellent value for money (materials available locally and at affordable prices).
The soil used for the earthbags came from excavations for a new sewage drainage system at Casa Chiaravalle. During the first week of the workshop, participants learned the various stages of earthbag construction, including filling, compacting, and positioning the bags.
The second technique, Earthship, allowed the reuse of glass bottles, inserted into a support structure and fixed with mortar. The objective was to recycle over 3,000 bottles to build a separation element, facilitated by a partnership with a company for the supply and recovery of containers. The 'bottle walls' are inserted into a wooden framework, where the bottles, arranged in overlapping rows, are fixed in position with mortar prepared on-site. In these walls (used on the west side of the building), circular openings were created using plastic pipes, dismantled from the water system installation and reused as permanent formwork.
The recovery, cataloguing and adaptation of numerous discarded windows allowed the reuse of over 60 square meters of frames (*Design for Disassembly*), used to create a transparent surface (with polycarbonate panels) to close the south and east facades of the building, improving natural lighting and solar gain and establishing visual connections between interior and exterior spaces.
A key aspect of the workshop was the recovery and reuse of waste materials from the site, as well as from donations and local distribution networks. In addition to excavated soil, glass bottles and window frames, reclaimed wooden beams from demolished existing structures and closure panels not used in the renovation of Casa Chiaravalle were also used.
The workshop aimed to explore the potential of applying a "harvest map tool" and developed the principle of "secondary use," prioritizing the reuse of materials in their existing form, thus optimizing and adapting available resources rather than subjecting them to recycling, which entails material reprocessing.
The project used 70% of materials sourced on site (within 10 kilometers: plastic pipes, wooden elements, paneling, soil), 20% locally (within 75 kilometers: bottles, fixtures, polypropylene fabric tubes), and 10% recovered from beyond 75 kilometers (mortar, metal wire, screws and bolts, polycarbonate panels).
The project demonstrated the feasibility of building with "Ø km" materials, achieving minimal environmental impact while maintaining high symbolic and architectural value.

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