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Beyond Demolition Waste: Recontextualizing Salvaged Materials through Circular Architectural Practices

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Abstract

Circular economy (CE) has gained worldwide recognition as a holistic approach to sustainable management in the built environment (BE). In contrast to the current linear 'take-make-dispose' logic, it enhances environmental and social well-being through strategies such as waste reduction, reuse, and recycling. Waste from the construction and demolition (C&D) sector in Algeria has reached alarming levels, affecting cities, nature, and the human element, while highlighting the urgent need for a transition towards circular and regenerative solutions to waste. This article explores the potential of implementing reuse as a post-demolition strategy to reduce debris accumulation, thereby integrating it as a material resource in everyday architecture. Several challenges, including demolition methods, inadequate infrastructure, poor regulatory frameworks, and the overall perception, hinder reusability in Algeria. Through qualitative analysis of successful reuse precedents, mainly in Mediterranean contexts, this paper explored how reuse approaches managed to integrate debris into the management process through reconstruction settings. Finally, strategies were recommended in the "exhibition" of reconstruction in outdoor spaces where users, stakeholders, and even students interact with reuse. This study contributes new knowledge by introducing recontextualized "innovative landfill" strategies, showcasing materiality and architectural concepts, which can revolutionize architectural and engineering choices when embracing circularity and regeneration.

Keywords: built environment, circular economy, demolition, reuse, waste management.

I- Introduction

Construction and demolition waste in Algeria has reached alarming levels, resulting in many management challenges (Bouhadiba et al., 2016). Demolition is preferred for buildings, even if they do not reach the end of their functional lifespan (Mangialardo & Micelli, 2018), largely due to numerous technical, functional, and aesthetic factors, rendering deconstruction impossible (Guillaume, 2021). Compared to household waste, C&D waste has received insufficient attention, leading to accelerated generation rates (Simay, 2020). Besides, current legislation primarily directs waste to landfills, transitioning only from uncontrolled dumping to controlled disposal (Aliouche, 2019).

Reuse has been explored in academia involving deconstruction and careful dismantling, yet there is a need for more research on demolition waste (Ginga, Ongpeng & Daly, 2020). It takes precedence over recycling by preserving material condition, value, and function for as long as possible (Munn & Soebarto, 2004). This circular strategy addresses the issue by adopting approaches to extend the life cycle of materials (Knoth, Fufa & Seilskjær, 2017). Implementing circular strategies in the built environment through reuse can establish value loops that convert debris into valuable resources (Jones & Comfort, 2018). However, challenges such as inadequate debris forms, acceptance, the lack of infrastructure, and the ingrown regulatory framework need to be addressed for viable debris reuse on Algerian demolition sites (AlJaber, Martínez-Vázquez & Baniotopoulos, 2023).

This paper explores the feasibility of implementing post-demolition reuse strategies to restore material value into renewed use cycles. The qualitative analysis of case studies from comparable contexts allowed the gain of insights into how these approaches can enhance C&DW management practices in Algeria. Architecture and reconstruction play pivotal roles in adapting resources from demolition works into innovative built environments. The practical methods enabled new adaptive, modular, flexible uses for debris in public spaces, thereby reducing waste and pressure on landfills.

1. Challenges of C&D waste management

Each year, Algeria is confronted with the generation of approximately 12 MT of inert waste that increases exponentially with C&D activities (Bouhadiba et al., 2016; AND, 2020). Their unstable generation patterns exhibit heterogeneous, irregular debris (Cook et al., 2022). In the absence of adequate sorting and recovery works, landfilling predominates for addressing both debris accumulation and illegal dumping (Journal Officiel, 2001). Additionally, recycling is limited to low-quality products through energy-intensive transformations, where initiatives remain underdeveloped due to infrastructural, technical, and policy-related barriers (Benammar, 2015; Rahla et al., 2021; Adams et al., 2017; Benamraoui & Berrached Berbar, 2021). As for waste management, labor often lacks technical training and processing equipment

(Bansal & Singh; Lynch, 2022). These challenges underscore a pressing need for more systemic models to preserve material value while addressing current management policies (Fénard, 2021).

2. Circular transition within the demolition context

In response to current challenges, the multifaceted CE offers systemic alternatives to the traditional

linear model, fostering regeneration and value creation throughout the product lifecycle (Collard, 2020; López Ruiz et al., 2019; Purchase et al., 2022; Gherman et al., 2023). In the circular built environment (CBE), the **butterfly diagram** distinguishes technical cycles upon which circularity frameworks enable ranked strategies such as reuse, recycle, and recover to preserve resources (EMF, 2015;

Zimmann et al., 2016). Implementing these strategies in the C&D sector faces

several technical constraints, such as demolition, for instance. By generating mixed debris from non-reversible systems, disassembly is hindered due to wet connections, such as the common cast-in-place concrete. Demolition in contexts like Algeria is not due to technical failure (Pantini & Rigamonti, 2020) but rather to real estate speculation, post-disaster interventions (Benammar, 2015), and infrastructural expansion. Combined with poor regulatory frameworks, appropriate salvaging becomes problematic (AND, 2020; Osaily et al., 2019). However, research showed that intrinsic value and performance are retained, supporting regenerative solutions even when post-demolition (Van den Berg, Hulsbeek & Voordijk, 2023).

3. Circular strategies in the BE

The 9R framework (Table 1) recognizes reuse as a preventive strategy to maintain materials at their highest value on the product, component, and building scales (Potting et al., 2017; Cervantes Puma et al., 2024). Importantly, in alignment with the "narrowing, slowing, and closing" of resource loops, reuse depends on the lifecycle, circularity level, and design innovation (Baldassarre et al., 2019; EMF, 2015). The framework conceptualizes actions that consider energy and transformation impacts, ranking reuse higher than repurposing and recycling (Zhang et al., 2022; Al-Faesly et Noël, 2023). In the CBE, complementary strategies such as Adaptive Aeuse and Design for disassembly (DfD) emphasize effective life extension of buildings and waste prevention via reuse (Pešta et al., 2023; Nicholson & Miatto, 2024). However, when these are ineffective, obsolescence is inevitable. Specifically, when contributing toward circularity, salvaging materials can reduce reliance on virgin materials (Adams et al, 2017; Purchase et al., 2022; Simay, 2021), divert waste from landfill while reducing disposal impacts (Gherman et al., 2023), retain embodied value, and stimulate local economies (Thomsen, Schultmann & Kohler, 2011; Grangeot, Parascho & Fivet, 2024).

Table 1: The 9R framework in the CE and relative strategies in the BE Sources: author, adapted from Potting et al. 2017; Chaudhary, 2023.

R-strategy	Goal in the BE	Demonstration	Value context
R0 - Refuse (most circular)	**Optimize use and production** (short loops) - Ecodesign - DfD	Make products redundant for another	
R1 - Rethink		Intensify the use of products by sharing	
R2 - Reduce		Increase efficiency with fewer materials consumed	
R3 - Reuse		Reuse a sound product with the same properties by another consumer	**Waste**

R4 - Repair	**Maximize the material and component lifespan** (medium loops) - DfD - Adaptive Reuse - Dismantling - Crushing	Maintenance and repair of defective products for the same function	**prevention**
R5 - Refurbish		Restore and upgrade old products	
R6 - Remanufacture		Use of discarded products (or parts) in new ones	
R7 - Repurpose		Use of discarded products (or parts) for different partial	
R8 - Recycle	**Valorize**	Processing materials to regain the	**Waste**
	materials (long loops) - Biomass	same or lower quality	**management**
R9 - Recover (least circular)		Incinerate with/without energy recovery	

4. Reuse as a debris management paradigm

Reuse prevents waste while retaining integrity and functional performance after deconstruction. Conversely, this multifaceted concept is approached differently across academia. According to Huygen (2008), reuse is a tripartite post-demolition strategy to reclaim materials that incorporates (1) direct reuse, (2) repurposing, and

(3) recycling (Table 2), each addressing levels of transformation and performance. This reflects the reality of demoltion sites, leading to embracing process-dependent actions and integrating multipurpose debris locally (Ben Khader, 2022). Particularly, on-site reuse is the most energy-efficient and logistically viable (Bellastock, 2021).

Table 2: Post-demolition reuse triad according to demolition-based contexts

(Sources: Talento et al., 2019; Al-Faesly & Noël, 2023; Devènes et al. 2022; Huygen, 2008; Sadi et al., 2012)

Reuse type	Definition	Example
Direct reuse Reuse of "function"	Using construction materials again for the same or similar function with minimal processing	Reusing concrete blocks for the same structural purpose, to build footbridges and other structures.
Repurpose Reuse of "shape"	Using construction materials and/or their parts again for a different function through reshaping and processing actions.	Reusing cut-corner steel bars as new wall shelves makes the purpose transition from reinforcement to non-structural applications

Recycle Reuse in other "cycle"	Breaking down waste into raw materials as inputs for new products, typically for multiple functions.	Crushing waste concrete to obtain new construction aggregates.

5. Contextual barriers to debris reuse

Many multifaceted barriers hinder the implementation of reuse in demolition-based contexts. Reusability is fundamentally impeded by modern construction cultures that favor complex materials and non-reversible built systems. This results in damage, heterogeneity, and contamination, while hindering collecting, sorting, and preparation (Hussain et al., 2024; Menegaki & Damigos, 2018). Reuse is economically less attractive when factors such as low landfill fees, the lack of processing infrastructure, and the deficiency of specialized waste companies (Ferlander & Wedin, 2021).

These pitfalls are highlighted by the complex, time-consuming logistics that coordinate the transportation of bulky or granular rubble across multiple sites (Purchase et al., 2022). From a regulatory perspective, national laws' insufficiency, alongside poor standards and incentives, deem reuse challenging (AND, 2020; Purchase et al., 2021; Osaily, Copping & McCann, 2022). This is exacerbated by the significant absence of precedents and pilot projects, limiting technical guidance and material knowledge for practitioners, which eventually hinders the recognition of CE principles among stakeholders (Al Jaber, Martínez-Vázquez & Baniotopoulos, 2023; Ferlander & Wedin, 2021; Huang et al., 2018). Lastly, these barriers trigger cultural reluctance, while further relegating the demand for recycled materials to landfill or wastage, thus preferring offers of novelty or renewal (Jina et al., 2017; Ferlander & Wedin, 2021). Thus, normalizing reuse encourages the development of targeted policies and awareness tools, while promoting convincing technical solutions, to shift current construction trends.

6. Feasibility of Post-demolition Reuse

Effective reuse practices are often considered during the design stages, making debris the core element of circular architecture creation (Monteil, 2020). Building upon the principle of "form follows availability", deconstruction supports matching available salvaged materials with the reuse project's demand to promote

context-responsive design (Gorgolewski, 2019). In demolition-based scenarios, debris can possess the technical and aesthetic autonomy that challenges

conventional standards, especially material uniformity (Huygen, 2008; Grangeot et. al, 2024). Lacking the properties and quality to fulfill a purpose leads to the emergence of "waste". In reality, waste is a judgment, not a fact, only seen as such because of disciplinary sights toward daily materials, which emphasizes uselessness and misplacement (Huygen, 2008). Architects can exploit irregularity by shifting to a "function follows form" logic, abandoning standard functionalism for materialistic functionality. This approach opposes the design driven by conventional selection of materials to fit a preconceived form. Instead of being transformed or discarded,

non-standardized debris can be taken as typically as-found, celebrating shape, texture, and patina to ensure harmony with disparate composition (Huygen, 2008).

In the same context, inventing creative methods of connection and assembly lies in a deep

understanding of available material properties. This is feasible when debris can

inspire new location-based expressions, often not replicated elsewhere, but with the same functional impact. Flexible techniques—such as gabion and opus incertum

—manifest functionality and expressiveness based on the essence of fragmented elements, moving from heterogeneity to pluralism in composition (Huygen, 2008; Grangeot, Parascho, & Fivet, 2024; Talento et al., 2020). This approach of feasibility can accommodate irregularity while supporting reversible and modular assets for further circular endeavors. Embracing debris richness in technical and visual terms offers promising solutions to align reuse with circular goals.

II- METHODS

This paper explores the potential of integrating reuse in the C&D waste management process through architectural applications. The applied methodological approach aligns with the implementation of CE principles to reduce waste and reliance on landfilling. This provided a nuanced understanding of how debris reuse can be valorized in transitional contexts to align circular design with waste management.

The qualitative, literature-based analysis suggested pathways to a foundational framework for demolition contexts, considering salvaging conditions, construction typologies, infrastructure, and logistics. To achieve this, the author focused on the following key aspects:

1. Identifying reuse methods by highlighting cases where designers were involved in the development of post-demolition reuse strategies.
2. Assessing the management processes that were fueled by reuse, assessing how material characteristics, their sources, and condition ensured reuse scenarios.
3. Synthesising the integration processes by examining how materials were adapted in reconstruction based on availability, integrity, logistics, and aesthetic levels, facing labor and human factors.

1. Case studies selection

The methodological approach drew upon case studies, selected for their relevance to the Algerian C&D waste context, as established in the literature review. Four key criteria were considered for the selection, which are presented in Tab. 3.

Table 3: Selection criteria of case studies of relevant reuse contexts

Geographical and contextual relevance	Material relevance and compatibility	Demolition methods and debris condition	Reuse potential and diversity

Mediterranean region. BE share typological similarities. Load-bearing walls, post-beam structures, and earthy materials. Similar colonial, post-colonial, and medina typologies. None are dismountable.	Similar inert waste (poured concrete, hollow bricks, perpend stones, other mixed rubble) resulting from wet connections. Significantly damaged debris. Mirrored conditions (non-uniformity, Irregularity, and non-hazardous contamination).	Heavy mechanical demolition. Complex, altered debris. Considerations or deconstruction, dismantling, or demolition reuse purposes.	Demonstration of a range of salvaging/reuse practices. Broad scope of reuse in landscape and architecture. Relative sorting, adaptation, and integration were relevant to similar available debris (not their presence in Algeria).

2. Analytical framework

Each selected case study was examined according to the following analytical trends, identified from the existing literature :

- Reuse context, motivations, and drivers.
- Debris condition, material status, and viability for reuse.
- Processing, reshaping, and preparation protocols.
- Technical adaptation, integration, concepts, and design-related reuse practices.
- Reception, impact, and aesthetic performance.

The analysis involved selecting six key reuse precedents are illustrated in Tab. 4.

Table 4: Selected international reuse precedents

Reuse project	Use history	Selection relevance
Hanil Information Center Danyang-gun, South Korea	-Visitor center	● Involved materials ● Synchronized construction, reuse, and reconstruction ● Reuse and adaptation diversity ● Didactic reuse
Clos Saint-Lazare (REPAR2) Paris, France	Factory - Landscape features	Anticipated reuse during both demolition and selective deconstruction processes ● Participatory reuse

Casa REX São Paulo, Brazil	House Office building	Recontextualizing material resources (local reuse) Creative reuse in both the facade and interiors

Déchetterie Saint-Martin-d'Hères Grenoble, France	Civic amenity site	● Material diversity ● Reuse of sensitive material like asphalt ● Multifctionality of the reuse setting
Ningbo Museum Ningbo, China	History Museum	● Material availability, quantity, and quality ● Poetic reuse for cultural continuity ● Cultural
Igualada Cemetery Barcelona, Spain	Extraction site Cemetery	● Intercontextual waste reuse flows ● Perfect integration with the environment

III- RESULTS & DISCUSSION

The reuse of C&D waste is recognized worldwide as an intermediate strategy for a circular shift. The previously analyzed case studies allowed contextual insights into reuse approaches and techniques that affect BE on a multidimensional basis. The study focused on replicable models for the Algerian context, following the trends in waste management practices.

1- Contexts and drivers of reuse

Reuse in architecture, as these cases demonstrate, is context-dependent and often shaped by site-specific goals, including the preservation of landscape and built identity. These drivers rely on conceptual and practical factors that respond to effective management and the circularity of debris within localized contexts.

For instance, in Saint-Martin d'Hères, designers erected a peripheral retaining wall using reclaimed inert debris to demonstrate how reuse can support urban integration and streetscape beautification. This approach minimized the need for new materials while reinforcing the site's continuity and serving both ecological and functional purposes. Similarly, the landscape regeneration at Igualada is another integration case that exemplifies a model for recovering authentic materials, such as natural stone from prior on-site excavations. This helped restore the topographical identity and embed the memory of the place through symbolic reuse without any material alteration. In Casa REX, architectural identity could be refined through the transformation of the pre-existing spatial settings. Material continuity ensured the creation of new configurations by legacy materials from the previous structures, inheriting the new materiality of the old to renovate the workplace. Promoting

historical and cultural agendas through reuse enforces education and public

awareness. In response to the rising costs of concrete, architects in Hanil reclaimed concrete for multiple process-dependent applications. This could serve a

pedagogical purpose, educating visitors about reuse within a contemporary language. Lastly, reuse

can be driven by collaborative learning and guidance workshops, where interdisciplinary communities can exchange through locally structured methodologies and governance frameworks. REPAR2 demonstrated how design guidelines, collaborative platforms, and reuse protocols can support

stakeholders' commitment and policy improvement. The intervention occurred on a factory site where diverse concrete structures were salvaged for experimentation. Such systemic instruments enabled shifting from isolated reuse to a structured and replicable model for implementing circularity.

Importantly, the cases don't quite converge into a singular model. Reuse should not be misunderstood as a whole. Rather, it should be taken as a practical introduction to a broader systemic shift toward circularity. Here, waste reduction is a priority for reducing pressure on landfill areas, and achieving this means returning waste to the same context through reconstruction-oriented reuse. This can retain material value in local loops, with architecture serving as a key creative agent. However, reuse remains marginal despite the rising piles, due to rapid urban expansion and housing policies, which provide good motives for valorizing and circulating debris, especially if outdoor environments can be less impactful. Local reuse, in particular, is advantageous for reducing costs and reinforcing spatial identity, which increases the likelihood of public adaptation and well-being. These spatial reflexions are supported by the inherent quality of debris, of naturally belonging to its built/unbuilt environment, with its evolving conditions. Such adaptability allows sites to become "embedded landscapes", where debris is not discarded but recontextualized in other use cycles. Thus, reuse near demolition sites enhances logistical feasibility, fosters creative reconstruction, and improves cohesion and visibility by aligning with the

local demands in terms of waste management, fostering a structured logic for reuse.

2- Material salvaging logistics

Circular design begins with targeted salvaging, as several factors, such as condition, integrity, availability, and material typology, directly affect reuse outcomes. As an

initial step to develop reuse-oriented schemes for mixed, deteriorated waste, reuse

was supported by converging logistical frameworks with reuse-based intentions. This enabled appropriate practices such as sourcing, transportation, conditioning, and adaptation across reuse processes.

In Saint-Martin-d'Hères and Igualada, concrete and unaltered stones were sorted specifically for earth-retaining and landscape purposes. A diversified strategy was implemented in Hanil, as concrete was gradually crushed to expand the scope of reuse in structural, decorative, and covering functions. These approaches showed

how site-based preparation can build a hierarchy of logistical tasks to suit a range of functions. In REX, sandstone and concrete chunks were set to have similar formal and structural properties, maximizing their integration potential by a combination of multiple techniques: opus incertum and gabion walls, highlighting diversity and cohesion in structure and aesthetics. Higher levels of profitable logistics lie in superuse—a concept that retains maximum integrity and function, while preserving

formal and symbolic value. The structurally sound concrete pipelines were subject to superuse by

upgrading their symbolic components to shelves.

We notice that even broken, irregular elements can retain technical viability when incorporated into composite reuse features. Salvaged debris ranges from whole to fragmented components and was classified according to functional relevance. These materials were prioritized due to their abundance, durability, and compatibility with

architectural applications. Horizontal structures such as pavements, gabion beds, and retaining walls typically require salvaged concrete or stone, while bricks and tiles are intended for vertical infill. However, dismantling techniques affect reuse, as standard demolition compromises cleanliness too, often contaminating rubble with plaster, rebar, or other non-hazardous residues, which is particularly evident in unreclaimable wet connections. In contrast, selective deconstruction (Ningbo) allowed the salvaging of intact materials in patterned assemblies to express quality, quantity, culture, and continuity. These approaches highlight prior differentiation and on-site sorting platforms to categorize debris according to functionality (Table 5).

Table 5: Condition and application categories of debris to process in the examples

Condition	Application
Intact or damaged Whole or fragmented	Structural or decorative Visible or hidden
Bulky or small Reparable or manageable	Vertical or horizontal Reusable or recyclable

Conditioning involves cutting, sawing, de-steeling, or crushing to calibrate rubble for improved uniformity and resizing if aesthetic coherence is prioritized over technical performance. Importantly, justifying reuse in terms of performance involves the coordination of labor and workflow to make adaptation viable. Logistics and labor defined reusability (Hanil, REPAR2, and Ningbo) as the strategies were tailored to available infrastructure and work capacities, even when not fully anticipated, requiring trained labor and synchronized timeframes. Scalability plays a key role as larger demolition projects generate more predictable volumes, allowing more coordinated planning, sourcing, and design integration. Therefore, reusability can be enhanced when salvaging and reconstruction are synchronized with demolition.



(a) (b) (c)

Figure 1: Conditioning logistics in REPAR2's reuse experimentation : (a) salvaging, (b) sawing, (c) on-site prototyping.

Source: (a) (b) (c) Bellastock

Ultimately, effective reuse commits to pre-project requirements and project-specific conditions. It increases when demolition and reuse sites are proximate enough to facilitate logistics and material handling. Consequently, reuse intentions must be considered at the sourcing phase, where material quality and distance determine

how, and to what extent, debris can be reconditioned. Local human knowledge and manual instruments as resources for force and skill to reuse. This overview of

operational logistics can lay the foundation for reconstruction and identify how such practices can adapt to the material data.

3- Reuse techniques and reconstruction settings

This section presents practical techniques for integrating debris into the landscape and reconstruction through adaptable, low-tech approaches, particularly for contexts where waste is discarded. These solutions can offer both performance and aesthetic value by balancing functionality with expressiveness. As underlined by Huygen (2008), each piece of debris embodies geometric and material potential, allowing autonomy in material uniqueness (essence) and reassembly (pluralism), through what is termed "inherent attraction". In practice, this quality highlights how elements naturally draw together to enable versatile integration because embracing material properties guarantees flexible connections and further disassembly.

Gabions attest to this logic when accommodating mixed and irregular debris, including broken concrete or obsolete tiles. Cases with quantitative relevance

(Saint-Martin d'Hères, Igualada, to Hanil) demonstrate how the versatile stratification of mixed components created coherent reassemblies. In other contexts (REX and Ningbo), the arranged intact elements in creative patchwork masonry reinforce local identity for visitors while showcasing visible traces of the original resource. The Wapan techniques (Ningbo) exemplify the combination of a collage of altered bricks, tiles, and stones with mortar to repair vertical structures. These results in

expressive monoliths merging integrity and art with culturally resonant concepts, showcasing the cultural landscape in prints.



(a) (b) (c)

Figure 2 : (a) Saint-Martind-d'Hères's gabioned wall reusing four reclaimed materials, (b) Wapan technique patchwork disparate bricks, stones, and tiles, (c) Casa Rex's bicolored gabioned facade.

Sources : (a) NA! Architecture, (b) François Terrien, (c) Rafaela Netto.

Retrofitting and recasting (Hanil) adapted fragmented elements for

"trans-functionality". Crushed concrete can be recast for secondary use, depending on multifunctional applications, such as translucent or opaque tiles, aggregates for insulation, and gravel as soil covering, proving that less intensive adaptations can reinforce cycles. Dry paving systems in Igualada exemplify low-energy and collective reuse, bypassing the need for sophisticated processing. The combination of pavements with the earth as mortar reinforced unified aesthetics, blending reused items with pseudo-natural components of the cemetery. This integration in REPAR2 allowed multi-reuse of concrete in many corners by implementing monochromatic

horizontal and vertical landscape-friendly features.



Figure 3 : (a) Hanil's gabioned facade using crushed concrete, (b) REPAR2's garden bed and pavement using respectively dry-stacking and opus incertum techniques, (c) Igualada's typographical gabions around the paved court using the site's stones.

Sources: (a) BCHO Architects Associates, (b) Bellastock, (c) Archdaily.

Across these examples, materials were arranged based on a hierarchy to affiliate salvaged items across several utility levels. For instance, larger elements can be prioritized for structural or visual prominence, while others are used as fillers or decorations. Medium debris is often sent to preparation and adaptation processes for many reuse scenarios. Therefore, grouping large fragments by stacking or caging shifts from a composition of "assembly" to "assemblage," which highlights the statements of Huygen (2008). This form of classification segregates each element or group to reduce the need for high-tech methods through light sorting and adaptation. Encore Heureux architects reinforce this approach through the "Material Mix", ranking the material choices from ecological to synthetic, which promotes the reuse

of materials. Coupled with Huygen's logic, this can reconcile reused materials with conventional ones. For example, concrete and stone can be paired with modern

bonding elements, while rectangular bricks fit into mortar to ensure alignment. These techniques can align with similar debris properties when fulfilling the same functions to solve technical constraints. The grouping based on typology, texture, and color encourages expressive spatial articulation, promotes architectural nobility while avoiding makeshift appearances. Open-air reuse can precede the natural blending of debris into the landscape, where they can organically interact with the environment's evolving "data". Waste can be upgraded to a resource when it is central to the circular design, where non-uniform elements contribute to multifunctionality.

4- Reception and Perception of Reuse

Despite technical potential, reuse has not yet been widely institutionalized due to cultural and aesthetic stigmas. Stakeholders can often associate the practice with poverty or opportunism, especially when reuse traces are too visible. Similar aesthetic concerns were reported in Saint-Martin d'Hères, where the created structures were described as "waste containers" rather than architectural settings (Fig. 4) . Despite the logical connection centered around "waste", such reactions

reveal resistance to the visual irregularity that clashes with standard expectations of order and novelty. Gabions can technically be effective, but are often perceived as crude waste entities if not carefully integrated into a larger architectural language.



Figure 4: Saint-Martin-d'Hères' main façade

(Source: NA! Architecture)

In Algeria, reuse is often biased as a symbol of informality and “slum architecture”. Similar attitudes, shaped by rigid aesthetic expectations, could compromise the practice in non-evolving building systems. Nonetheless, assumed informal reuse practices do exist, such as filling cavities or repaving damaged walkways with fragments. This demonstrates a spontaneous culture that could be contextually formalized through a shift in meaning. This dual perception presents a unique opportunity when guided through curated, participatory design. Then, these inherent practices can be reframed into a formal culture, already embedded in common habits and identity. Visual autonomy must be intentionally crafted into legible forms to convey visible memory and thus, overcome acceptance hurdles. Moreover, the essence of improvisation should align with reuse to respond to site-specific needs in terms of adaptation, cleanliness, and livability with the forms.

Importantly, the supply-demand interplay within CE is central to sustaining urban flows in undeserved contexts. Conventional material supply chains often cannot meet public demand, but reuse inputs can fill this gap with immediately available resources. In this light, reuse can serve both the pragmatic and factual roles when substituting scarce materials and reshaping the community's viewpoint on the triad of demolition, management, and reuse. Thus, democratizing reuse requires controlling the visibility of material if structurally feasible by making design intentions legible and shifting cultural expectations. When fragments contribute expressive wholes, reuse can be seen as more than a second-rate management—but as an architectural language emerging from demolition.

5- Conclusive Discussion

The findings of this paper reveal a substantial gap between the identified strategies and the current local practices. While the examples have demonstrated the potential of using salvaged debris, even in its altered condition, such approaches remain absent in Algeria. This is not only due to inherent technical incompatibility but also to the interplay between structural, cultural, and regulatory barriers that may inhibit implementation. In the deliberate processes, materials could be revalorized through integrated circular design. Despite damage and fragmentation, reused elements were adapted to versatile structures and perpetual uses, benefiting from supportive logistics and policy. In contrast, operations on Algerian demolition sites rely on mechanized, non-selective clearance methods that prioritize speed and

cost-efficiency. This overrated policy leaves debris altered and untraceable, while blocking the physical and logistical potential for reuse.

The study identified six key areas for improvement to ensure Algeria’s reliability on the relevant international experience (Tab. 6).

Table 6: Improvement areas for Algeria based on international experience

Improvement areas	Results overview (abroad and locally)
Demolition methods and salvaging techniques	Selective demolition practices preserve material integrity and support on-site reuse. ● Demolition practices are predominantly less planned and heavily mechanized, relying on fast and clear

Material adaptation and technical constraints	• Despite the presence of similar materials (concrete, bricks, stones, and tiles), the absence of adaptation strategies, such as resizing, limits their reintegration into new structures.
Design concepts integration	• Reuse is embedded in the architectural concepts, responding to site-specific needs and reflecting the memory of "reuse" sites. In Algeria, the differentiation between demolition and design phases prevents such integration.
Cultural reception and aesthetic acceptance	• Foreign cases often celebrate reuse as a creative and symbolic act of material regeneration. • In Algeria, salvaged debris is largely perceived as undesirable matter, associated with poverty or poor construction ingredients.
Logistics and infrastructure	• International studies relied on dedicated sorting areas, skilled labor teams, and specialized reuse agents. • None of these practical opportunities is available in Algeria.
Regulatory framework and economic incentives	The majority of the studies reuse contexts that provided financial and legal support for reuse. In Algeria, landfilling remains cheaper than recycling or reuse, despite the emerging research on the first.

The most relevant issue is the absence of reliable data on demolition waste flows and statistical information in Algeria, which must be acknowledged for further research. The targeted classification of C&D waste types, the recorded rates of sorting or salvage, and the institutional dynamics for traceability are lacking in the context of landfill and erratic site clearance. Moreover, decisions not based on measurable references render the circular transition complex and unachievable. Nevertheless, the gap between the successful foreign precedents and local reality opens up a gate for an innovative potential. These examples were not the result of a perfect construction resource; they emerge from contexts with limited means and unsuitable debris, but with creative human ability. Instead of being parameters for a contextual comparison, they can serve as inspiring, applicable models of reusability.

Despite the limitations, successful waste reinterpretation was conducted through progressive design and low-tech, cost-effective methods rooted in place. Similarly, Algeria can learn from these solutions and initiate similar processes. While debris reuse remains underdeveloped, this research underscored a potential for adaptation through architectural and material design approaches, building on the gradual shifts in perception, regulation, and practice. Importantly, the pinpointed priority areas can suggest localized adaptation and implementation solutions for Algeria.

IV- CONCLUSION

This paper has explored the feasibility of reusing inert demolition debris within reconstruction approaches. The study revealed that reuse is possible in the management paradigm, emphasizing a dual reality; the practices can be technically adaptable to demolition-based contexts through low-tech design, and their integration relies on overall reception. The commonality of successful reuse drivers

lies in architectural intentionality and proximity to reuse sites, as they are contextually embedded. These drivers have been absent in Algeria due to site clearance and landfill. The challenge of poor valorization is not merely technical nor related to material availability, but is relatively cultural and visually communicative.

Without appropriate adaptation to encompass salvaging and sorting, reuse must overcome some technical impracticalities, which highlight an urgent adoption of coordinated dismantling and logistics to initiate reusability. Reuse is technically, aesthetically, and spatially feasible, particularly for outdoor features where public

interaction can prevail. However, changing perception must precede widespread primary implementation to justify its worthiness by normalizing its aesthetics through public-facing projects and compelling material narratives, reducing public stigma.

Waste can turn into a meaningful feature through a logic that extends beyond mere structural requirements that demand visual framing and awareness to shift perceptions to a resource, managed to be useful again.

To advance a viable reuse-based circular model, future implementation of reconstruction projects in Algeria must prioritize leading recommendations. When these converge, demolition waste ceases to be an environmental liability and can become a revived resource for place-making for perpetual lifecycles in the BE:

1. **Integrate reuse into the design process for flexible functions** Anticipating reuse from the outset helps mitigate unpredictability, which implies embedding design intents that extend beyond waste management. Ancestral building techniques such as gabions, opus incertum, and dry stacking can be reintroduced as versatile compositions with high flexibility and further dismantling potential. These can be complementary to integrating heterogeneous items into

low-structural and highly visual applications. Hierarchical thinking must guide the assembly following material conditions to maximize technical layering and visual coherence. Normalizing reuse via pluralist integration prioritizes the “whole” result rather than the sole “element” at multiple assembling levels.

2. **Develop effective alternatives to demolition methods**

Given the incompatibility of the local construction culture with reuse standards, adopting partial selective demolition can help salvage sound and less damaged output. This involves elevating basic, informal, and manual practices between careful dismantling and demolition to allow further sorting and preparation for reuse. These suggestions can be developed through intensified dismantling guidelines and pilot projects for demonstration. Upgrading artisans to construction workers can help diversify interventions into the salvaging and preparation processes.

3. **Create local infrastructure and reuse logistics**

Develop basic infrastructure, such as material storage areas or material transfer hubs, in low-impact outdoor spaces. This can be reinforced by implementing remote facilities such as rented equipment and small-scale labs for testing and prototyping.

Investing in skilled labor through local know-how toolkits encourages adaptive conditioning by integrating low-tech skills, but requires training programs. This implies not only local artisans but also collectors who often invade demolition sites, searching for copper and steel reinforcement.

4. Support experimentation and build knowledge

Implementing pilot projects must reinforce reusability by demonstrating successful outcomes. These specimens can serve as exhibition features in public outdoor spaces near demolition sites to foster the acceptance of reuse in daily life.

Temporary features can be more sustainable and resilient for high technical and/or aesthetic risk avoidance. Showcasing the benefits of architectural integration in

low-risk environments can foster cultural appreciation, particularly among users. This also implies fostering of already rooted, adaptive reuse cultures among experienced users to socialize the practice.

5. Engage communities and raise awareness among stakeholders Overall, interdisciplinary acceptance builds upon promoting reuse campaigns by targeting internal and external stakeholders. Architects, engineers, construction workers, and users can mutualize their efforts in experimental workshops and exhibitions to accelerate the cultural shift. Organizing exchange areas at each process is fundamental to start collaboration.

6. Promote research and development on reuse

Reuse-based design education programs should be incorporated into universities, promoting knowledge transmission through studios and technical courses for young architects as part of sustainable architecture curricula. Moreover, institutional support for field research is key to overcoming diverse barriers to salvaging and reuse practices. The coalitions between academics, professional stakeholders, and municipalities would not only help develop small-scale reuse guidelines but also lead to reuse-friendly processes.

7. Enable policies and incentives to prioritize reuse practices

This requires introducing legal and economic instruments such as landfill taxes, credits for reuse operations. Also, when municipalities have to be engaged in the politicization of reuse for upcoming demolitions, they must provide material-related equipment and develop localized policies. This requires drafting primary frameworks

that start at the municipal level and broad further to reinforce resource flows and sustainable plans. As a start, designating locally evolving SMEs and startups as key intermediaries to groundbreak.

Bibliography

Adams, K. T., & Osmani, M., & Thorpe, T., & Thornback, J. (2017). Circular economy in construction: current awareness, challenges, and enablers. Waste and Resource Management, 170(1), p15-24. https://doi.org/10.1680/jwarm.16.00011

Agence National des Déchets. (2020). Rapport sur la Gestion des Déchets en Algérie. Agence

National des Déchets.

https://and.dz/rapport-sur-letat-de-la-gestion-des-dechets-en-algerie/

Aliouche, S., & Kehila, Y., & Benkahoul, L. (2017). Modalités de sélection des sites d'enfouissement technique en Algérie et leur prise en charge par les instruments d'aménagement du territoire et d'urbanisme. Déchets, Sciences et Techniques. https://doi.org/10.4267/dechets-sciences-techniques.3696

AlJaber, A., & Martínez-Vázquez, P., & Baniotopoulos, C. (2023). Barriers and Enablers to the adoption of Circular Economy concept in the building sector: A Systematic literature review. Buildings, 13(11), 2778. https://doi.org/10.3390/buildings13112778

Baldassarre, B., & Schepers, M., & Bocken, N., & Cuppen, E., & Korevaar, G., & Calabretta, G., (2019). Industrial Symbiosis: towards a design process for eco-industrial clusters by integrating Circular Economy and Industrial Ecology perspectives. Journal of Cleaner Production, 216, 446-460. https://doi.org/10.1016/j.jclepro.2019.01.091

Benamraoui, F., & Berrached Berbar, W. (2021). The Reality of Circular Economy in Algeria and its Contribution to Sustainable Development. Revue d'Economie et de Management, 20(2), 92-109

Benoît, J., & Bellastock (2018). REPAR#2: Le Réemploi passerelle entre architecture et industrie. France : Bellastock, ADEME.

Bouabdallah, M. A., & Hamou, K., & Messaoudi, M., & Bouabdellah, A. (2008). Déchets de Chantier du Bâtiment. Gestion et Traitement des Déchets Solides, Skikda, Algeria.

Bouhadiba, B., & Hamou, A., & Matejka, G., & Hadjel, M., & Kehila, Y. (2016). Proposition de scénario de gestion des résidus solides urbains dans la région d'Oran, Algérie. Techniques Sciences Méthodes, 11, 95–118. https://doi.org/10.1051/tsm/201611095

Braungart, M., & McDonough, W. (2002). Cradle to cradle: Remaking the way we make things. New York: North Point Press.

C3Editor. (2025). Hanil Cement Visitors Center & House. C3Globe. https://c3globe.com/hanil-visitors-center-and-guest-house-by-bcho-partners/

Chaudhary, S. (2023). The 9R framework and what you should know about it. https://www.linkedin.com/pulse/9r-framework-what-you-should-know-shamita-chaudhary/

Collard, F. (2020). L'économie circulaire. Courrier hebdomadaire du Centre de Recherche et d'Information Socio-Politiques CRISP, 2455-2456, 5-72. https://doi.org/10.3917/cris.2455.0005

Cook, E., & Velis, C. A., & Black, L. (2022). Construction and Demolition Waste Management: A Systematic Scoping Review of risks to occupational and public health. Frontiers in Sustainability, 3. https://doi.org/10.3389/frsus.2022.924926

Court circuit - NA ! Architecture. (n.d.). http://www.na-architecture.fr/portfolio/court-circuit/

Divisare. (2018) Miralles Tagliabue EMBT, Estudio Carme Pinós, Randhir Singh: Igualada Cemetery. Divisare.

https://divisare.com/projects/394894-miralles-tagliabue-embt-estudio-carme-pinos-randhir-si ngh-igualada-cemetery

Ellen MacArthur Foundation - EMF (2015). Towards a circular economy: Business rationale for an accelerated transition. Ellen MacArthur Foundation.

Fénard, G. (2021). Conception circulaire et réemploi en architecture, expertises et acteurs : le rôle du valoriste. (Master's thesis). Université de Liège: Liège, Belgium. https://matheo.uliege.be/handle/2268.2/12556

Gorgolewski, M. (2019). The Architecture of Reuse. IOP Conference Series Earth and Environmental Science. 10.1088/1755-1315/225/1/012030

Hobson, B. (2016, August 18). Wang Shu's Ningbo History Museum built from the remains of demolished villages. Dezeen; Dezeen.

https://www.dezeen.com/2016/08/18/video-interview-wang-shu-amateur-architecture-studio-ningbo-history-museum-movie/

Huygen, J.M. (2008). La Poubelle et l'Architecte: Vers le Réemploi des Matériaux. Arles: L'impensé.

Hwang, W. (2014). BCHO Architects · Hanil Visitors' Center and Guest House. Divisare.

Retrieved September 4, 2022, from

https://divisare.com/projects/275259-bcho-architects-hanil-visitors-center-and-guest-house

Jones, P., & Comfort, D. (2018). The construction industry and the circular economy.

International Journal of Management Cases, 20 (1). 4-15. https://eprints.glos.ac.uk/5562/

Lynch, N. (2022). Unbuilding the city: Deconstruction and the circular economy in Vancouver. Environment and Planning a Economy and Space, 54(8), 1586–1603. https://doi.org/10.1177/0308518x221116891

Mangialardo, A., & Micelli, E. (2018). Rethinking the construction industry under the Circular

Economy: Principles and case studies. In Green energy and technology (pp. 333–344). https://doi.org/10.1007/978-3-319-75774-2_23

McManus, D. (2025). Casa Rex São Paulo office in Pacaembu, Brasil. E-architect. https://www.e-architect.com/saopaulo/casa-rex-pacaembu

Menegaki, M., & Damigos, D. (2018). A review on current situation and challenges of construction and demolition waste management. Current Opinion in Green and Sustainable Chemistry, 13, 8–15. https://doi.org/10.1016/j.cogsc.2018.02.010

Monteil, C. (2020). Déconstruction: Mode de réemploi (Master's thesis). ENSA Paris Val de Seine, Paris.

Munn, S., & Soebarto, V. (2004). The Issues of Using recycled materials in architecture. The 38th International Conference of Architectural Science Association ANZAScA "Contexts of Architecture". Launceston, Tasmania.

NA ! Architecture. (2018). Déchèterie Saint Martin d'Hères. Na-Architecture.fr. http://www.na-architecture.fr/2018/09/decheterie-saint-martin-dheres/

Nicholson, V., & Miatto, A. (2024). Architects as Catalysts of Reuse in Construction. Nature Cities, 1, 179–181. https://doi.org/10.1038/s44284-024-00042-8

Pantini, S., & Rigamonti, L. (2020). Is selective demolition always a sustainable choice ?

Waste Management, 103(15), 169-176. https://doi.org/10.1016/j.wasman.2019.12.033

Potting, J., & Hekkert, M.P., & Worrell, E., & Hanemaaijer, A., (2017). Circular Economy: Measuring Innovation in the Product Chain. PBL Netherlands Environmental Assessment Agency: The Hague.

Puma, G. C.C ., & Salles, A., & Turk, J., & Rajčić, V., & Puche, A. M., & Korniejenko, K., Tsalkatidis, T., & Tavares, V., & Martos, R. P., & Ruchinskaya, T., & Bragança, L. (2024). Circular Economy Best Practices in the Built Environment. In Springer tracts in civil engineering (pp. 5–24). https://doi.org/10.1007/978-3-031-73490-8_1

Purchase, C. K., & Zulayq, D. M. A., & O'Brien, B. T., & Kowalewski, M. J., & Berenjian, A., & Tarighaleslami, A. H., & Seifan, M. (2021). Circular Economy of Construction and Demolition Waste: A Literature Review on Lessons, Challenges, and Benefits. Materials, 15(1), 76. https://doi.org/10.3390/ma15010076

Rahla, K., & Mateus, R., & Bragança, L. (2021). Implementing Circular Economy Strategies in

Buildings—From Theory to Practice. Applied System Innovation, 4(2), 26. https://doi.org/10.3390/asi4020026

Ruiz, L. A. L., & Ramón, X. R., & Domingo, S. G. (2019). The circular economy in the construction and demolition waste sector – A review and an integrative model approach. Journal of Cleaner Production, 248, 119238. https://doi.org/10.1016/j.jclepro.2019.119238

Saieh, N. (2019, October 24). Hanil Visitors Center & Guest House / BCHO Architects. ArchDaily.

https://www.archdaily.com/72484/hanil-visitors-center-guest-house-bcho-architects

Simay, P. (2021). Reuse as a Primary Resource. Les Cahiers de la recherche architecturale urbaine et paysagère, 11. https://doi.org/10.4000/craup.7092

Talento, K., & Amado, M., & Kullberg, J.C. (2020). The Reuse of Waste Heaps from Extraction Sites: An Architectural Methodology. Sustainability, 12(16), 6548. https://doi.org/110.3390/su12166548

Van Den Berg, M., & Hulsbeek, L., & Voordijk, H. (2023). Decision-support for selecting demolition waste management strategies. Buildings and Cities, 4(1), 883–901. https://doi.org/10.5334/bc.318

WasteOnline (2022). The hierarchy of waste. WasteOnline. https://wasteonline.uk/blog/the-hierarchy-of-waste/

Pheng, C.B.W., & Yi Qin, J.W., & San, K.S., & Xuan, O.E., & Zheng Wei, R.O., & Hoe, T.W. (n.d.). Wapan Technique used in Ningbo Historic Museum to Revive Traditional Chinese Construction Techniques. Taylor's University.

Zhang, C., & Hua, M., & Di Maio, F., & Sprecher, B., & Yang, X., & Tukker, A. (2022). An overview of the waste hierarchy framework for analyzing the circularity in construction and demolition waste management in Europe. Science of the Total Environment. 803. 149892. https://doi.org/10.1016/j.scitotenv.2021.149892

Zimmann, R., & O'Brien, H., & Hargrave, J., & Morrell, M. (2016). The Circular Economy in the Built Environment (M. Blackbourn & Polon, Eds.). London: ARUP. https://www.arup.com/globalassets/downloads/insights/cirular-economy-in-the-built-environment.pdf