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Sustainable Interior Design Using Recycled Materials: Development of Reusable Interior Elements from Reclaimed Wood, Waste Glass, Textile Waste and Reused Tiles

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Abstract
Interior design has a significant role in determining the materials used in residential, commercial and institutional spaces. Conventional interior finishes can depend on virgin resources and may contribute to waste when products are damaged, replaced or renovated. This paper examines how recycled, reclaimed and reused materials can be incorporated into interior elements while balancing visual quality, functionality, safety, durability, maintenance and environmental responsibility. It focuses on reclaimed wood, waste glass, textile waste and reused or broken tiles, with a design-development direction that combines broken tiles and recycled glass into modern geometric surface textures for wall panelling and other suitable interior applications.
The study adopts a design-led, mixed-method approach: a literature review, a material-audit and screening framework, a case study, a questionnaire survey of 20 respondents (mainly interior designers and students aged 18–25), and two proposed prototypes, a terrazzo-style glass-and-ceramic tile (ReGlass-Cera) and a modular acoustic ceiling panel (ReCycleCeil). Survey respondents were strongly receptive to recycled materials (80% would use them at home or work; 80% would accept them for decorative wall panels), but only 55% were confident that they are durable enough for interior use, and 35% answered “maybe”. The prototypes have not yet been fabricated or tested, so no performance claims are made. The paper does not assume that recycled content alone guarantees sustainability. It offers a transparent framework for material screening, modular and repairable detailing, and evidence-based sustainability indicators, intended to support responsible material selection and later experimental work.
Keywords: sustainable interior design; recycled materials; reclaimed wood; waste glass; textile waste; reused tiles; circular economy; material reuse; design for disassembly; material passport; low-impact interiors; prototyping.

1. Introduction

1.1 Background

Interior design shapes how people use and experience buildings through spatial planning, furniture, finishes, lighting, colour, acoustics and material selection. Materials are often chosen for appearance, cost, availability and performance. Yet every material also has a history: it is extracted or manufactured, transported, installed, maintained, and eventually repaired, reused, recycled or discarded. A sustainable interior considers this wider life cycle rather than looking only at the finished surface. The scale of the issue is not limited to interiors; building materials as a whole

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carry a substantial climate burden (United Nations Environment Programme, 2023), and circular-economy policy frameworks emphasise keeping materials in use for longer (European Commission, 2020).

Construction, renovation, retail and household activities generate offcuts, damaged components, packaging, old furniture, textiles and broken finishes. Some of these materials still have useful physical or visual qualities. Reclaimed wood may retain grain and character; glass fragments can provide colour and light; textile waste can add softness or acoustic potential; and leftover tiles can become durable decorative surfaces. Their usefulness depends on their condition, safe processing, reliable sourcing and the needs of the proposed application.



Figure 1: A reclaimed-wood feature wall in a residential interior. Source: Houzz.

Using recycled material does not automatically make an interior sustainable. A product may require energy-intensive processing, hazardous adhesives, difficult-to-separate composites or frequent replacement. Good design therefore asks where the material comes from, how it is prepared, what performance is required, how it can be repaired and what happens at the end of its useful life.

1.2 Sustainable Interior Design

Sustainable interior design aims to reduce avoidable environmental impact while creating spaces that are healthy, functional, comfortable, inclusive and visually meaningful. It can include reuse of existing buildings and furniture, efficient space planning, durable finishes, low-emission products, daylight and energy awareness, responsible sourcing, water-conscious specification, and planning for repair or disassembly. This paper concentrates on material reuse in interior elements. It explores how selected waste streams can be transformed into useful components without treating waste as a decorative theme alone: the design should have a clear function, a buildable detail, a safe finish and a plausible maintenance plan.

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Figure 2: Material samples made from waste glass and textiles. Source: UNSW Newsroom.

1.3 Recycled, Reclaimed, Reused, Upcycled and Salvaged Materials

The terms below are used in this paper as follows.

Term	Meaning in this paper
Reused	Items used again with little or no reprocessing, after cleaning, repair or adaptation.
Reclaimed	Materials recovered from old buildings or previously used products after checking their condition and safety.
Recycled	Waste processed into new raw materials or products, considering processing energy and quality.
Upcycled	Discarded items transformed into new products with improved usefulness or added value.
Salvaged	Components recovered before demolition or disposal, with their source, condition and dimensions recorded.

2. Research Problem, Aim, Objectives and Scope

2.1 Research Problem

Interior projects frequently rely on new manufactured boards, stone, glass, metal, textiles and decorative finishes even when usable materials may be available from renovation waste, workshops, old furniture or local suppliers. Reclaimed materials are not always adopted because designers may be uncertain about quality, consistency, safety, availability, cost, technical performance and how to detail them attractively. Poorly designed recycled products may also be difficult to repair or separate at the end of their life. The core problem is therefore to understand how selected recycled and reclaimed materials can be turned into practical interior elements while balancing aesthetics, function, durability, safety, cost and environmental considerations.

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2.2 Aim

To investigate the practical use of recycled and reclaimed materials in interior design and develop a design proposal for functional, visually coherent and repairable interior elements using materials such as reclaimed wood, waste glass, textile waste and reused tiles.

2.3 Objectives

1. To review published research and guidance on sustainable interiors, circular design, material reuse and design for disassembly.
2. To identify suitable local sources of reclaimed wood, waste glass, textile waste and leftover or salvaged tiles.
3. To document each material's condition, dimensions, contamination risks, availability and likely processing needs.

2.4 Research Questions

1. Which reclaimed or recycled materials are practical for selected interior applications?
2. What concerns prevent designers or clients from using these materials more widely?
3. How can different recycled materials be combined without compromising usability, safety or durability?
4. What detailing methods make the proposed element easier to repair, replace or disassemble?
5. How can material sourcing, waste reduction and design performance be documented credibly?
6. Which features, if any, may justify further novelty and prior-art investigation?

2.5 Working Proposition

The working proposition is that a carefully designed interior element made from selected reclaimed and recycled materials can provide functional and aesthetic value while supporting material reuse, especially when its components are durable, repairable and separable. This is a proposition to investigate, not a proven result. Its validity depends on actual material condition, processing requirements, user feedback and prototype evaluation.

2.6 Scope

- The paper focuses on interior elements rather than claiming to solve all construction-waste problems.
- Reclaimed wood, waste glass, textile waste and reused or leftover tiles are studied as candidate materials.
- Applications considered include feature panels, modular partitions, display units, work surfaces, decorative insets and ceiling panels.
- Sourcing, selection, processing, assembly, finish, maintenance and end-of-life thinking are included.
- Site visits, a material audit, a questionnaire and small prototypes are used where access and resources permit.

3. Literature Review

The literature reviewed covers circular material management, design for disassembly, reclaimed timber, recycled glass, textile-waste panels and life cycle assessment. Table 1 summarises each source and its relevance to the present study.

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Table 1: Summary of reviewed literature

Source	Theme	Key point	Relevance to this study
Mhatre, Gedam & Unnikrishnan (2024)	Circular economy	Material reuse requires effective management and coordination.	Supports sustainable material selection and reuse in interior design.
Ostapska, Rüther, Loli & Gradeci (2024)	Design for disassembly	Designing buildings for disassembly supports material recovery and reuse.	Helps develop modular, repairable interior panels.
Godina et al. (2025)	Reclaimed timber	Grading, certification and material recovery are important for timber reuse.	Supports safe selection and reuse of reclaimed wood in interiors.
Robert, Baez & Setunge (2022)	Recycled glass	Recycled glass can be processed into construction components through appropriate material development and testing.	Supports experimental development of recycled-glass panels and textures.
Jucienė et al. (2022)	Textile waste	Panel structure and manufacturing methods influence strength and sound-insulation performance.	Supports the use of textile waste in decorative and acoustic panels.
Premathilaka et al. (2024)	Recycled glass aggregates	Recycled glass can substitute for conventional aggregates, with technical challenges to consider.	Background for recycled-material composite surfaces (a glass study, not direct evidence on reused tiles).
Roberts et al. (2023)	Life cycle assessment	Environmental impacts of circular design strategies need to be evaluated through life cycle assessment.	Helps compare recycled-material panels with conventional alternatives.

Taken together, these sources indicate that reuse depends on management and verification (Mhatre et al., 2024; Godina et al., 2025), that detailing for separation enables recovery (Ostapska et al., 2024; International Organization for Standardization, 2020), that recycled glass and textile waste

can be developed into interior and construction components when material development and testing are done properly (Robert et al., 2022; Jucienė et al., 2022), and that environmental claims should be tested through life cycle assessment rather than assumed (Roberts et al., 2023; ISO, 2006a, 2006b).

The evidence is uneven across materials. The reviewed work on glass and textiles is comparatively direct, whereas no reviewed source addresses reused or broken ceramic tiles as an interior surface, and the glass-aggregate review (Premathilaka et al., 2024) cannot stand in for it. Studies of terrazzo tiles incorporating glass and construction and demolition waste (Stabile et al., 2021) provide the closest technical reference for the tile prototype in Section 6. This gap is one reason the present project is framed as design development and not as validated performance.

4. Research Methodology

4.1 Research Design

The research is organised into six stages: (1) literature review and prior-art search; (2) identification of local waste streams; (3) material audit and risk screening; (4) concept and detail development; (5) prototype construction and evaluation; and (6) analysis, documentation and recommendations. Each stage should produce evidence that informs the next. At the time of writing, stages 1, 4 and the survey component of stage 2 are reported; stages 3 and 5 are specified as protocols and have not yet produced results. A prior-art search of official patent and design records (Office of the Controller General of Patents, Designs and Trade Marks, n.d.) is required before any claim of novelty is made.

4.2 Material Sourcing and Audit

Possible suppliers include carpentry shops, furniture repair units, renovation contractors, tile retailers, glass workshops, tailoring units and upholstery workshops. For each, the audit asks whether material can be collected legally and safely, whether its source is known, and whether the supplier can provide consistent quantities. Permission is obtained before removing material from a site or using a supplier's photographs.

Every sample receives an ID (for example RW-01 for reclaimed wood, WG-01 for waste glass, TW-01 for textile waste and RT-01 for reused tile). The record includes source, date, quantity, dimensions, approximate mass, visible condition, contamination risks, preparation required, possible application, and the reason for acceptance or rejection.

4.3 Material Screening Criteria

Candidate materials are screened against eight criteria (Table 2).

Table 2: Material screening criteria

Criterion	Key question	Evidence
Condition	Is the material clean, undamaged and suitable for use?	Visual inspection, measurements, photographs
Safety	Are there sharp edges, mould, dust, harmful coatings or embedded metals?	Source history, risk assessment, appropriate safety tests

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Criterion	Key question	Evidence
Function	Can the material meet load, wear, cleaning and privacy requirements?	Prototype testing, technical data, professional assessment
Aesthetics	Do colour, texture, grain and pattern match the design concept?	Sample boards, user feedback
Availability	Is sufficient material available for the proposed design?	Supplier records, quantity assessment
Cost	What are the costs of collection, transport, cleaning, cutting and finishing?	Itemised cost sheet, supplier quotations
Repairability	Can damaged parts be replaced without removing the entire panel?	Exploded drawings, disassembly trials
End of life	Can the components be separated, reused or recycled?	Connection details, material identification, disassembly assessment

4.4 Site Selection

A site may be a material recovery source, a workshop, an interior location where the proposed element might be installed, or a hypothetical design brief. Where an actual site is used, its name, location, date of visit, dimensions, permissions and intended use are recorded. Where access is unavailable, the design is labelled a proposal and no site observations are invented.

4.5 Case Study

A studio visit provided a reference for interior materials, furniture detailing, surface finishes and space utilisation (Figure 3). Wooden built-in seating and partitions create a warm, continuous appearance; a grey surface finish contrasts with the wooden furniture; repeated rectangular wall details suggest a modular logic that could be translated into recycled-material panels; and integrated seating and shelving use space efficiently. These observations point to an opportunity to explore geometric surface panels made from recycled glass and broken tiles, with reclaimed wood as an optional frame.

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Figure 3: Studio interior used as a case-study reference, showing warm wood, grey surfaces and modular geometric wall details.

4.6 Questionnaire Survey

A 15-question online questionnaire was administered to 20 respondents recruited by convenience sampling, covering respondent profile (Q1–Q2), awareness of sustainable interior design and material reuse (Q3–Q5), material and application preferences (Q6, Q11), and attitudes towards durability, local sourcing, cost and wider adoption (Q7–Q10, Q12–Q15). Responses are summarised using counts and percentages with N stated.

4.7 Data Analysis and Ethics

- Material-audit data are organised in a comparison table.
- Survey answers are summarised using counts and percentages; open comments are grouped into themes only when those themes appear in the data.
- Prototype results are compared against predefined criteria rather than changing criteria after the outcome is seen.
- Photographs and annotated drawings document design changes.
- Measured results, participant opinions, literature findings and design assumptions are kept separate.

Participation is voluntary and its purpose is explained. Unnecessary personal information is not collected. Permission is obtained for site photographs, interviews, supplier details and the use of copyrighted images. Materials are sourced legally and safely, and participants and the public are not exposed to untested components, sharp glass or uncertain coatings.

5. Survey Results

5.1 Respondent Profile

Of the 20 respondents, 18 (90%) were aged 18–25 and 2 (10%) were aged 26–35. Twelve (60%) were interior designers, five (25%) were students and three (15%) were other professionals. The sample is therefore young and design-literate, which should be borne in mind when interpreting the results.

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5.2 Awareness, Preferences and Attitudes

Table 3: Survey responses (N = 20 for every question)

Question	Responses, n (%)
Q1. Age group	18–25: 18 (90%); 26–35: 2 (10%)
Q2. Profession	Interior designer: 12 (60%); student: 5 (25%); other professional: 3 (15%)
Q3. Heard of sustainable interior design?	Yes: 17 (85%); No: 3 (15%)
Q4. Aware waste materials can be reused in interior design?	Yes: 19 (95%); No: 1 (5%)
Q5. Seen recycled materials used in interior spaces?	Yes: 16 (80%); not sure: 3 (15%); No: 1 (5%)
Q6. Preferred recycled material	Scrap wood: 8 (40%); broken tiles: 7 (35%); waste glass: 4 (20%); recycled plastic: 1 (5%); fabric waste: 0
Q7. Recycled materials help reduce environmental waste?	Yes: 20 (100%)
Q8. Would use recycled materials at home or workplace?	Yes: 16 (80%); maybe: 4 (20%)
Q9. Would accept recycled materials for decorative wall panels?	Yes: 16 (80%); maybe: 3 (15%); No: 1 (5%)
Q10. Would use recycled materials for furniture or partitions?	Yes: 17 (85%); maybe: 2 (10%); No: 1 (5%)
Q11. Preferred interior application	Furniture: 8 (40%); decorative accessories: 8 (40%); wall panels: 2 (10%); partitions: 2 (10%); ceiling panels: 0
Q12. Recycled materials durable enough for interior use?	Yes: 11 (55%); maybe: 7 (35%); No: 2 (10%)
Q13. Support use of locally available waste materials?	Yes: 15 (75%); No: 3 (15%); maybe: 2 (10%)
Q14. Would choose a recycled product at the same cost?	Yes: 14 (70%); maybe: 4 (20%); No: 2 (10%)
Q15. Recycled materials should be used more widely?	Yes: 15 (75%); not sure: 4 (20%); No: 1 (5%)

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Counts are derived from the percentages shown in the online-form summary charts for 20 responses; slices without a printed label are inferred as the remainder to 100%.

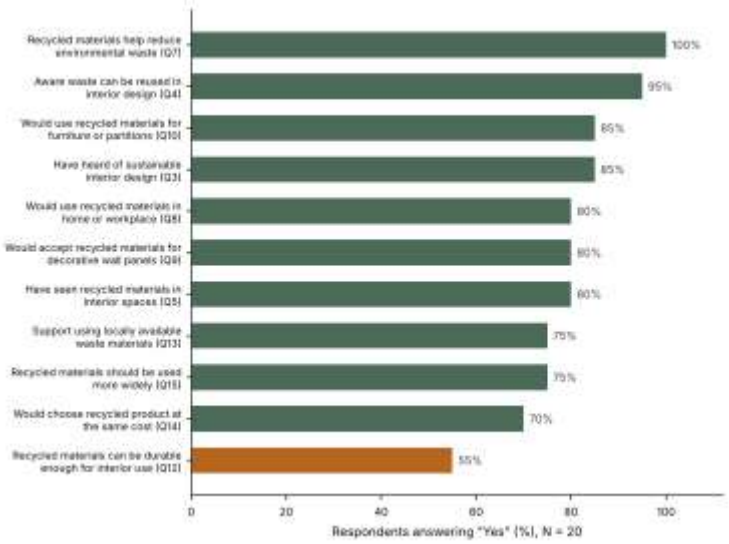


Figure 4: Share of respondents answering "Yes" to each attitude and awareness question (N = 20). The durability question (highlighted) had the lowest agreement.

5.3 Interpretation

- **Awareness and acceptance are high.** Nearly all respondents knew that waste can be reused (95%) and all believed recycled materials reduce waste (100%). Eighty per cent would use recycled materials at home or work and would accept them for decorative wall panels, and 85% would use them for furniture or partitions.
- **Durability is the main doubt.** Only 55% answered "yes" to durability, with 35% "maybe" and 10% "no". This is consistent with the concern, raised in the literature, that quality and performance of reclaimed materials are uncertain, and it makes testing of the prototypes essential.
- **Cost parity matters.** Seventy per cent would choose a recycled product at the same cost as a conventional one, and 20% were undecided, suggesting that price and perceived value are additional adoption factors.
- **Material preferences align with the design direction.** Scrap wood (40%), broken tiles (35%) and waste glass (20%) accounted for 95% of preferred materials, supporting the exploration of reclaimed wood frames with tile and glass inserts.
- **Preferred applications differ from the proposed focus.** Furniture and decorative accessories (40% each) were preferred far more often than wall panels (10%), and no respondent chose ceiling panels. Likewise, no respondent preferred fabric waste, although the ReCycleCeil concept (Section 6.5) is based on it. These responses do not invalidate the wall-panel and ceiling concepts, since 80% would accept wall panels, but they suggest that a furniture or accessory application should be considered alongside them.

These findings reflect stated attitudes of a small convenience sample. They indicate receptiveness and concerns; they are not evidence that any proposed material or product performs well.

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6. Concept and Design Development

6.1 Design Direction and Concept

The working concept is "From Waste to Workspace": a modular interior wall or feature-panel system using reclaimed wood as the primary frame and replaceable inserts made from one or more selected waste streams, such as textile panels, protected glass pieces or reused tile sections. The design should demonstrate that material reuse can create a useful interior element, not only a decorative collage.

The system uses a limited and well-documented palette. A practical first prototype could combine reclaimed wood with textile waste for a soft insert, or reclaimed wood with reused tile for a durable accent zone. Glass is included only where a safe edge and retention detail can be demonstrated, and it is not necessary to use every material in one product if doing so compromises performance or separation. The design should transform discarded but usable materials into a modular element whose parts can be inspected, repaired and replaced, and its language should communicate honesty of material, practical craft and long-term adaptability.



Figure 5: Reclaimed-timber feature wall reference. Source: SITU, Watson Library Feature Wall.

6.2 Design Principles

- **Reuse before recycling:** consider whether an item can be used directly before processing it.
- **Material honesty:** identify what each component is made from and avoid misleading sustainability claims.
- **Modularity:** define repeatable panel or insert dimensions where material sizes allow.
- **Reversible connections:** use accessible screws, clips or other suitable mechanical fixings where practical.
- **Replaceability:** allow a damaged insert to be changed without discarding the entire element.
- **Safe edges and surfaces:** remove splinters, protect glass edges and provide cleanable finishes.
- **Repair-first maintenance:** make common wear parts accessible and replaceable.
- **Design for separation:** avoid unnecessary permanent bonding between incompatible materials.
- **Local sourcing:** document where materials came from and transport requirements.
- **Evidence-led claims:** report test conditions and limitations clearly.

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6.3 Potential Interior Applications

Table 4: Candidate applications, material strategy and key checks

Application	Material strategy	Important checks
Feature wall panel	Reclaimed-wood frame; broken tile or recycled glass inserts; modern geometric patterns and textures.	Panel weight and wall-fixing strength; sharp-edge protection; easy cleaning; fire safety of backing and adhesives.
Modular screen / partition	Reclaimed-timber frame; replaceable textile panels or protected glass inserts; sections that can be dismantled.	Structural stability and anchoring; privacy and light transmission; impact resistance and accessibility; ease of repair.
Display / shelving element	Reclaimed wood for shelves and supports; recycled tile or protected glass accents; replaceable decorative sections.	Load capacity; strength of joints and fasteners; surface finish and cleaning; stability and resistance to tipping.
Reception backdrop	Wooden modules with broken-tile patterns; recycled glass as a protected insert; repeated geometric composition.	Secure wall fixing; resistance to scratches and stains; easy maintenance; access to concealed services.



Figure 6: Modular recycled-textile wall panels in a 30 × 30 cm format. Source: Requecho.

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Figure 7: Reception backdrop concept combining wooden modules with a recycled-material terrazzo-style floor (design visualisation).

6.4 Prototype 1: ReGlass-Cera Terrazzo Tile

This prototype investigates the reuse of waste glass and broken ceramic tiles as decorative aggregates in a cement-bound, terrazzo-style tile. The design is inspired by the multicoloured, irregular aggregate pattern of the reference surface in Figure 8. Waste glass contributes colour variation and reflectivity, while broken ceramic fragments introduce opaque, patterned pieces. The aggregates are embedded in a light-coloured matrix to create a unified surface with a contemporary terrazzo appearance.



Figure 8: Reference terrazzo surface with multicoloured aggregates. Source: Atelier Minéral.

Development would include waste sorting, aggregate grading, mould preparation, casting, curing and surface finishing, with several trial samples prepared to compare aggregate proportions and surface quality. The finished samples should be evaluated for dimensional consistency, surface integrity, abrasion, water absorption, strength, maintenance and slip resistance, using the requirements and test methods of EN 13748-1 for internal terrazzo tiles, before any flooring-performance claims are made. Related work on terrazzo tiles with glass and construction and demolition waste (Stabile et al., 2021) and on eco-tiles (Ansaloni et al., 2017) provides technical context.

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6.5 Prototype 2: ReCycleCeil, a Sustainable Acoustic Ceiling Panel

Concept. ReCycleCeil is a proposed ceiling-panel system that transforms discarded textiles into functional ceiling elements combining material reuse, visual appeal and acoustic comfort. Modular geometric panels are arranged within a ceiling grid, creating a contemporary appearance while allowing individual panels to be removed or replaced for maintenance.

Material composition. The panel combines recycled fabric waste, recycled PET fibres and a reclaimed wooden frame. Fabric waste, such as discarded cotton, polyester or blended textiles, forms the recycled surface layer; PET fibres are proposed as the acoustic core; and the wooden frame provides support and defines the panel shape. The final composition and binder should be established through prototype trials.

Dimensions. The proposed prototype is a modular hexagonal ceiling panel with a suggested overall size of approximately 600 × 600 mm and a thickness of 12–18 mm, consisting of a recycled fabric composite layer, a PET-fibre acoustic core and a supporting reclaimed-wood frame. These are preliminary design values to be adjusted after fabrication and testing.

Manufacturing process. Discarded fabric is collected, sorted, cleaned and cut, then combined with recycled PET fibres and a selected binder to form a panel mixture. The mixture is placed in a mould and compressed to the required shape and thickness, cured or dried according to the binder requirements, finished and fixed within the reclaimed-wood frame. The prototype should then be inspected for surface consistency, edge quality, structural stability and secure installation.

6.6 Module Strategy, Connections and Finishes

A starting design grid could use a 300 mm or 400 mm planning module, adjusted to the actual recovered material dimensions; these values are concept options, not prescribed standards. A module study should show the number of panels, overall width and height, joint lines, edge trims and replacement sequence, using real sample dimensions rather than assuming reclaimed stock is uniform. A wall-panel assembly might comprise a backing or frame, a primary reclaimed-wood component, a replaceable infill cassette, a mechanical retention detail and a finish or edge profile, documented by a section and an exploded axonometric drawing.

Connections are selected according to the actual material and use. Screws and bolts support later disassembly but can split reclaimed timber if edge distances and pilot holes are unsuitable; clips or removable brackets may suit replaceable panels; a glass or tile insert needs positive retention and a compatible backing, and friction alone should not be treated as reliable protection. Adhesive may be required in some cases, but its use should be recorded and its effect on repair and separation considered. Finishes are chosen for the use environment, not only appearance: a dry decorative wall panel has different requirements from a high-touch counter or a wet area, and a finish should not hide unresolved contamination or make future separation impossible without a clear reason.

7. Sustainability Evaluation, Health, Safety and Quality Control

Sustainability is evaluated through documented indicators rather than a single label. Useful indicators include the mass and percentage by mass of recovered material used, the quantity of material rejected, local transport distance, the amount of new material required, the number of replaceable parts, the repair procedure and the disassembly time. These do not equal a full life cycle assessment (ISO, 2006a, 2006b), but they provide transparent project evidence (Table 5).

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Table 5: Sustainability indicators

Indicator	Suggested calculation / record	Caution
Recovered material mass	Weigh each recovered component used in the prototype.	State scale precision and whether moisture or coatings affect mass.
Recovered-content share	Recovered material mass ÷ total material mass × 100%.	Define whether fasteners, backing and finishes are included.
Material waste	Record offcuts, unusable pieces and leftover stock.	Separate waste avoided from waste merely shifted to another stage.
Replaceability	Record whether one insert can be changed without damaging neighbours.	A drawing alone does not prove it; demonstrate the process.
Disassembly	Time and note the steps needed to separate components.	Use consistent conditions and repeat trials where feasible.
Cost	Collection + transport + preparation + fabrication + finish + hardware.	Compare against a functionally equivalent alternative.
Service life	State intended use and evidence available for durability.	Do not claim a lifespan without supporting evidence.

7.1 Health, Safety and Quality Control

- Inspect reclaimed wood for nails, screws, splitting, rot, insect damage and unknown coatings.
- Do not use mouldy or chemically contaminated material without suitable professional assessment.
- Use appropriate protection and controlled processes when cutting, sanding or handling recovered materials.
- Protect glass edges and ensure pieces cannot fall out of the frame.
- Check that tile and glass mass is appropriate for the backing and fixing system.
- Record the binder, adhesive, coating or finish used and retain product data where available.
- Confirm fire, indoor-emission, accessibility and building-code requirements for the intended installation.
- Use professional advice for any overhead, structural or public-safety-critical application.

8. Discussion

The evidence gathered so far supports three observations. First, there is receptiveness: respondents overwhelmingly accept recycled materials in principle, including for decorative wall panels, which supports continuing the design direction. Second, there is a confidence gap: durability, cost parity and the choice of application attract hesitation, which is exactly where physical testing and

transparent documentation can add value. Third, the literature supports the technical plausibility of glass and textile reuse and of detailing for disassembly, but offers little direct evidence on reused ceramic tiles, so tile-based claims remain a hypothesis.

It is important to separate what has and has not been shown. User opinion is positive, but material testing is incomplete, and positive feedback should not be reported as proof of performance. A prototype that looks successful but cannot be disassembled would be a design weakness to be revised, and a beautiful surface may still be heavy, hard to clean or difficult to replace. Where a material proves unavailable or unsafe, that constraint should be documented, and the rejection of an unsuitable material is itself a valid research outcome.

Statements such as “100% eco-friendly”, “zero waste” or “saves a specific percentage of carbon” should be avoided unless a defensible calculation supports them. A student project can credibly report the measured mass of recovered material used and the amount of offcut waste generated; broader comparisons require a defined functional unit, service life, baseline product, and transport, processing and end-of-life assumptions.

9 Conclusion and Future Scope

This paper has investigated how reclaimed and recycled materials can be used to create practical interior elements. It starts from the recognition that material selection affects more than appearance: it also influences resource use, maintenance, health, durability, cost and the ability to repair or recover components. Reclaimed wood, waste glass, textile waste and reused tiles each offer potential, but each also carries different technical and safety considerations.

The proposed design direction is a modular interior element in which a primary frame supports replaceable inserts made from selected recovered materials, illustrated by the ReGlass-Cera terrazzo-style tile and the ReCycleCeil acoustic ceiling panel. A survey of 20 respondents shows strong willingness to use recycled materials, tempered by uncertainty about durability. Until the material audit and prototype tests are completed, the design should be described as a proposal rather than a proven sustainable product. The intended contribution is a documented process connecting sourcing, risk screening, material selection, modular detailing, prototype evaluation and end-of-life planning.

References

1. Ansaloni, F., Paris, E., & Grandinetti, V. (2017). The case of eco-tiles. *Renewable Matter*.
2. European Commission. (2020). *A new Circular Economy Action Plan: For a cleaner and more competitive Europe*. https://environment.ec.europa.eu/strategy/circular-economy-action-plan_en
3. European Committee for Standardization. *EN 13748-1: Terrazzo tiles for internal use* (requirements and test methods).
4. Godina, M., et al. (2025). Strategies for salvaging and repurposing timber elements from existing buildings in the UK. *Journal of Cleaner Production*, 489, 144629.
5. International Organization for Standardization. (2006a). *ISO 14040:2006, Environmental management — Life cycle assessment — Principles and framework.*
6. International Organization for Standardization. (2006b). *ISO 14044:2006, Environmental management — Life cycle assessment — Requirements and guidelines*.

7. International Organization for Standardization. (2020). *ISO 20887:2020, Sustainability in buildings and civil engineering works — Design for disassembly and adaptability — Principles, requirements and guidance*. https://www.iso.org/standard/69370.html
8. Jucienė, M., Dobilaitė, V., Albrektas, D., & Bliūdžius, R. (2022). Investigation and evaluation of the performance of interior finishing panels made from denim textile waste. *Textile Research Journal*, 92(23–24), 4666–4677.
9. Mhatre, P., Gedam, V., & Unnikrishnan, S. (2024). Management insights for reuse of materials in a circular built environment. *Waste Management & Research*, 42(5), 396–405.
10. Office of the Controller General of Patents, Designs and Trade Marks, Government of India. (n.d.). *Patent information and official guidance*. https://ipindia.gov.in/
11. Ostapska, K., Rüther, P., Loli, A., & Gradeci, K. (2024). Design for disassembly: A systematic scoping review and analysis of built structures designed for disassembly. *Sustainable Production and Consumption*, 377–395.
12. Premathilaka, B., Liyanapathirana, S., Leo, C., & Hu, L. (2024). Application of recycled waste glass to replace traditional quarried aggregates: A comprehensive review. *Journal of Building Engineering*, 86, 108846.
13. Robert, M., Baez, E., & Setunge, S. (2022). A new technology of transforming recycled glass waste to construction components. *Construction and Building Materials*, 313, 125539.
14. Roberts, C., Allen, S., Clarke, J., Searle, J., & Coley, D. (2023). Understanding the global warming potential of circular design strategies: Life cycle assessment of a design-for-disassembly building. *Sustainable Production and Consumption*, 37, 331–343.
15. Stabile, P., Radica, F., Ranza, L., Carroll, M. R., Santulli, C., & Paris, E. (2021). Dimensional, mechanical and LCA characterization of terrazzo tiles along with glass and construction and demolition waste (CDW). *Recent Progress in Materials*, 3(1), 006. https://doi.org/10.21926/rpm.2101006
16. United Nations Environment Programme. (2023). *Building materials and the climate: Constructing a new future*. https://www.unep.org/resources/report/building-materials-and-climate-constructing-new-future