



Deliverable 2.3.1.

**Manual: Practical guidelines for
circular economy implementation
in furniture sector**

FULAR - IPA-ADRION00373

Shaping new paths towards FURNITURE circularity

Deliverable 2.3.1.

Manual: Practical guidelines for circular economy implementation in furniture sector

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Executive Summary

Unlike the traditional "take-make-dispose" model, the circular economy aims to keep resources in use for as long as possible, minimising waste while maximising the value of products. This model aims to create a closed-loop system where materials are continuously cycled back into the economy, reducing environmental impact and promoting sustainability.

The model of a circular economy presents an alternative to linear system of accelerating waste production. It aims to conserve natural resources by substituting products with services and designing things to be used again and again before the materials are recovered. Finally, materials are recovered and recycled back into new resources, reflecting the cycling of elements in natural systems, in which the waste from one process is the food for another.

The circular economy in the wood and furniture sector focuses on minimizing waste, extending the life of materials, and promoting sustainability throughout the product lifecycle.

Context of FULAR Project (Shaping new paths towards Furniture circularity)

The IPA ADRION region is known for its long tradition of furniture production thanks to its rich forestry resources. However, differences in approaches and development have led to varying uses of local wood, post-production waste, and consumer waste. Small and medium-sized enterprises (SMEs), regardless of their size and capacities, face challenges in introducing greener and more sustainable production processes in order to align their operations with EU strategies and guidelines. At the same time, consumers are becoming increasingly focused on circular economy and sustainability when purchasing products.

The FULAR project addresses these challenges through a set of activities aimed at enhancing the circular economy and implementing new solutions in the furniture sector. The consortium, which includes partners from IPA and ERDF countries, brings together universities, research institutes, sectoral clusters, development agencies, and entrepreneurship centres from Greece, Italy, Albania, Bosnia and Herzegovina, Serbia, Slovenia, and Croatia. The transnational approach enables collaboration between different actors and networks, developing joint solutions relevant to the entire program area and transferable beyond the project region.

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The main goal of the project is to identify concrete and cost-effective ways to promote sustainability in the wood sector. Activities include research into SMEs' and consumers' perceptions of the circular economy, analysis of best practices, and identification of the most innovative and cost-efficient technologies. The project will also explore the best materials for sustainable furniture production, using local wood, secondary raw materials from post-production, and materials from consumer waste. To stimulate innovation, FULAR will organize a circular design competition and three international workshops on materials engineering. Winning projects will be prototyped and tested, demonstrating the application of innovative circular solutions. A special focus will be placed on capitalizing project results through a dissemination and transferability plan beyond FULAR.

Introduction to the dedicated work package (WP2)

One of the main expected results of FULAR is the delivery of practical guidelines for the implementation of the circular economy in the furniture production sector.

WP 2 will provide scientific and technological evidence on selected sustainable materials and the main cost-effective technologies and techniques to bring the furniture sector towards the adoption of a circular way of thinking.

The crucial segment of WP2 is adoption of the guidelines which implies set of preparatory activities to be completed, with the main purpose to foster integration of circular business models in regional (Adriatic - Ionian region) furniture industry. Focus of these activities is on individuation of practical solutions based on the studies (including the ones labelled as "scientific") regarding circular materials and innovative technologies and techniques introduced among the transnational forest-based industries.

Specific studies and research activities will be conducted by the partners in two separate project activities:

- Activity 2.1 Scouting best green material solutions for furniture sector. Analysis will be conducted for the individuation of 3 different types of sustainable materials to use. More specifically, wood species, post-industrial wood raw materials, and furniture parts of end-life items will be studied and strategically selected to individuate the best suited material solutions and bring furniture production towards the implementation of circular economy approaches. This study phase will enable the disposal of a selection of 3 best green solutions for the furniture sector – one innovative material per type of resource listed above. As a result of the analysis process, a Report on best material solutions for sustainable furniture products will be provided to allow the increase of knowledge on the most eco-friendly materials in the sector. The analysis will then be used as input, together with results coming

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from other project activities (primarily A 2.2), for the development of the Guidelines Manual for the implementation of a circular economy for the furniture sector.

- Activity 2.2 Scouting cost-effective technologies for circular production. Technology is directly related to lower waste generation and optimal resource utilisation. Nowadays, individuating innovative technologies and techniques can make the difference and be one of the main instruments to make a successful transition to a circular economy. Therefore, exploring innovative and best cost-effective technologies to process, reuse, and recycle, and reassemble materials from discarded furniture and production waste will enable the identification of the most suited ones for the furniture sector, in terms of costs and practical implementation. Potentials of the design software currently in use or prepared for future application will be explored, with the results disseminated to the SMEs. Consequently, new approaches in marketing will be considered, implying business models based on the multiple options for re-use of purchased items, including partial re-construction and re-assembling.

Upon the completion of this activities, by using findings and acknowledgments gained within, partnership will develop manual (guidelines) containing strategic guidelines for the specific case of the furniture companies. Compiling of the guidelines document will be performed within Activity 2.3 Practical guidelines for circular economy implementation in furniture sector. The document will have a specific practical importance for the SMEs, as they would be in a better position to work on the development of their own circular business models. Furthermore, they will be in position to be more competitive in the arrangements, which are providing them with an option to dispose of the used furniture, depending on the type of the materials. The document will be shared with the sectoral actors of the Adriatic - Ionian area and it will be aimed at summarising strategic information which could be helpful for the SMEs to start implementing circular economy models into their production processes.

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About the deliverable

The deliverable, Practical Guidelines for Circular Economy Implementation in the Furniture Sector, provides a structured and accessible overview of key concepts, strategies, and practical approaches supporting the transition of the furniture and wood-processing industry towards circular economy models. Developed within the framework of the FULAR project, the document translates findings of the surveys and scouting reports prepared in the initial stage of project implementation: D.1.1.1. Surveys for SMEs and consumers; D.2.1.1 Scouting Report: best material solutions for sustainable furniture product design; and D.2.2.1 Scouting Report: innovative and cost-effective technologies, into clear guidance tailored to the needs of small and medium-sized enterprises (SMEs), designers, students, and other stakeholders operating in the furniture sector.

The document addresses circular economy principles from a holistic perspective, covering the entire furniture value chain - from material sourcing and product design to manufacturing, use, and end-of-life management. It introduces fundamental concepts such as the shift from linear to circular economic models, the 9R framework, circular design principles, and circular business models, while placing particular emphasis on the role of wood as a renewable and strategic material within circular systems. Special attention is given to practical implementation.

Realistic and market-ready material solutions are presented, focusing on locally relevant wood species, sustainable materials, post-industrial residues, and reused components. In addition, the document highlights the growing importance of digital tools, platforms, and advanced concepts - such as design for disassembly, refurbishment networks, and furniture-as-a-service models - in enabling circular practices across the sector.

The Practical Guidelines for Circular Economy Implementation in the Furniture Sector reflect the specific context of the Adriatic-Ionian region, while remaining broadly applicable to furniture manufacturers and stakeholders in other regions. Throughout the document, environmental considerations are integrated with economic and operational perspectives, emphasizing resource efficiency, value retention, and long-term competitiveness. Overall, this practical guidelines serves as both an introductory reference and a practical roadmap for organizations seeking to understand, adopt, and scale circular economy practices in the furniture sector. It aims to support informed decision-making, encourage innovation, and contribute to the development of more resilient, sustainable, and circular furniture value chains.

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Introduction

The furniture and wood-processing sector is entering a period of structural transformation. Rising material costs, resource scarcity, supply chain volatility, changing consumer expectations, and increasing climate-related pressures are challenging traditional production models. Linear systems based on the “take–make–use–dispose” approach are proving economically vulnerable and environmentally unsustainable.

In this context, the circular economy is not merely an environmental concept, but a strategic framework for improving resource efficiency, strengthening resilience, and creating long-term value. For the furniture sector, circularity translates into designing products for durability, reparability, modularity, and recyclability; optimizing material use; reducing waste across production processes; and developing business models that extend product lifecycles and retain value within the system¹.

Wood, as a renewable and bio-based material, occupies a central position in this transition. When responsibly sourced and efficiently utilized, wood enables cascading use, component reuse, and long service life applications. However, achieving circular performance in wood-based furniture requires deliberate design decisions, appropriate technologies, transparent material flows, and coordination across the value chain.

At the same time, the regulatory and market environment is evolving. Emerging European policies related to product design, transparency, lifecycle management, and producer responsibility are gradually redefining expectations placed on manufacturers. For small and medium-sized enterprises (SMEs), adapting to these changes requires practical, realistic, and economically viable approaches rather than large-scale structural overhauls.

This guidebook has been developed to support that transition. It combines strategic context with concrete tools, material guidance, digital solutions, repair-oriented approaches, and step-by-step implementation recommendations tailored to the furniture sector. With a particular focus on SMEs operating in the Adriatic–Ionian region, the document aims to translate circular economy principles into actionable measures that can be gradually integrated into everyday business practice.

¹ ECE/TIM/SP/49, Forestry and Timber Section, Geneva, Switzerland, GENEVA TIMBER AND FOREST STUDY PAPER 49 - Circularity concepts in forest-based industries [Online] Available at: https://unece.org/sites/default/files/2022-05/Circularity%20concepts%20in%20forest-based%20industries%20ECE_TIM_SP_49.pdf

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1. From Linear to Circular Economy

1.1. The Linear Economic Model

The linear economic model is based on the extraction of raw materials, their transformation into products, consumption, and final disposal as waste (Figure 1). While this model has supported economic growth and industrial development, it has also resulted in excessive resource use, environmental degradation, and increasing waste generation. In the furniture sector, linear models often lead to short product lifespans, limited repair options, and significant volumes of post-consumer waste.

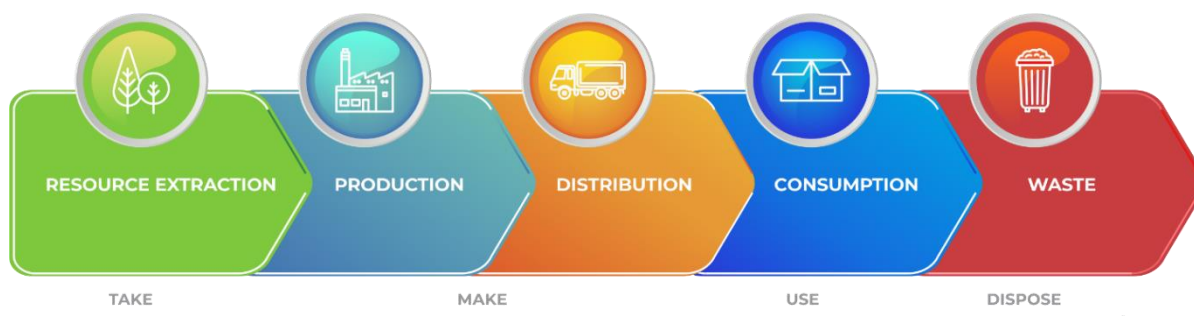


Figure 1: Linear economy concept

1.2. The Circular Economy Concept

The circular economy represents a systemic alternative to the traditional linear model of production and consumption. Instead of extracting resources, using them once, and discarding them as waste, the circular economy aims to keep materials, products, and resources in use for as long as possible, while minimizing waste generation and environmental impacts (Figure 2).

The European Commission defines a circular economy as an economic system in which the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste is minimized ²

In practical terms, circularity involves designing products that last longer and can be repaired, reused, refurbished, or recycled, as well as rethinking production processes,

² European Commission (2020). *A new Circular Economy Action Plan – For a cleaner and more competitive Europe*. COM (2020) 98 final

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logistics, and business models to reduce material inputs and environmental pressures across the entire product life cycle.

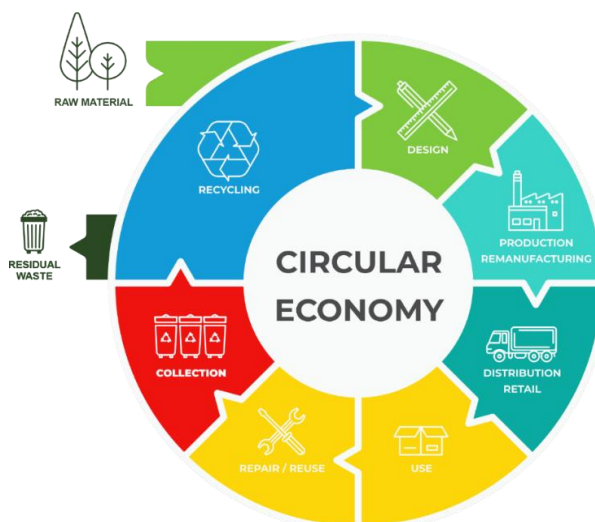


Figure 2: Circular economy concept

1.3. Circular Economy in the Furniture Sector

For furniture manufacturers, the transition towards circular economy practices is not only an environmental response, but also a strategic business opportunity. Circular approaches can contribute to reduced material costs, improved resource efficiency, greater resilience to supply disruptions, and enhanced market positioning, while supporting compliance with emerging environmental regulations and growing customer expectations.

The furniture sector is particularly relevant for the application of circular economy principles due to its intensive use of raw materials, long and complex value chains, and significant generation of production and post-consumer waste. Furniture products are largely based on wood and wood-based materials, but typically also combine additional materials such as metals, plastics, textiles, adhesives, and surface coatings, which makes both design choices and end-of-life management especially important.

In a circular economy context, furniture products are designed with a focus on **durability, repairability, modularity, and disassembly**. This allows products to remain in use for longer periods, be repaired or upgraded during their lifetime, and be more easily reused, refurbished, or recycled at the end of use. Design decisions made at early stages play a decisive role in determining whether furniture products can support circular strategies or become waste after a short lifespan.

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Circularity in the furniture sector involves optimizing production processes to reduce material losses, increasing the use of post-industrial wood residues, and integrating secondary raw materials where feasible. Design-for-disassembly and component standardization further enable the repair, replacement, and recycling of individual furniture elements, extending product lifespans and reducing waste.

However circular strategies such as recycling or material substitution do not automatically result in lower environmental impact if they involve high energy use, material down-cycling, or short product lifespans. From a wood technology perspective, the highest sustainability benefits are achieved when circular approaches are combined with long service life, efficient material use, and appropriate end-of-life management.

The introduction of traceability and component identification systems allows furniture elements to be linked to material, production, and technical data. This enables customers to easily identify faulty components and request targeted replacements, while manufacturers can efficiently reproduce or supply the required elements, minimizing material consumption and environmental impact.

Complementary business models, such as repair services, take-back schemes, and refurbishment, support reverse logistics and strengthen circular furniture systems by maintaining manufacturer responsibility beyond the point of sale.

Finally, the end-of-life phase is a critical element of circular furniture systems. By applying strategies such as reuse, refurbishment, remanufacturing, and recycling, furniture products and materials can be reintegrated into economic cycles, reducing the need for virgin resources and minimizing waste. However, achieving this requires cooperation among manufacturers, designers, suppliers, consumers, and waste management actors, as well as supportive regulatory and market conditions.

2. Circular Strategies and Business Models

2.1. The 9R Framework

The circular economy is often described through the 9R framework, which represents a hierarchy of strategies ranging from the most preventive to the least circular. The framework illustrates how different interventions can be applied across a product's life cycle to reduce resource use, retain value, and minimize waste.

The 9R framework includes the following strategies: Refuse, Rethink, Reduce, Reuse, Repair, Refurbish, Remanufacture, Repurpose, Recycle, and Recover. These strategies form a

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continuum, from interventions that prevent resource use altogether to those that recover value at the very end of a product's life.

Higher-order strategies such as Refuse and Rethink challenge the necessity of products and promote alternative solutions, including service-based models and sharing systems. Reduce focuses on increasing efficiency in production and use by minimizing material and energy inputs. Mid-level strategies such as Reuse, Repair, and Refurbish aim to extend the lifespan of products and components, preserving their functional and economic value. Remanufacture and Repurpose enable the transformation of used products or parts into new applications, either with the same or a different function. Finally, Recycle and Recover represent lower-priority strategies, as they often involve higher energy consumption and greater material quality losses, and should therefore be considered as last-resort options. A key principle underlying the 9R framework is that circularity must be considered at every stage of a product's life cycle, from conceptualization and design to production, use, and end-of-life management. Among these stages, the design phase plays a decisive role, as it largely determines a product's durability, repairability, disassembly potential, and suitability for reuse or recycling. Circular design promotes careful material selection, prioritizing secondary and renewable materials where possible, as well as production processes that are energy-efficient and generate less waste.



Figure 3: The 9R Framework³

³ Source: Conceptualizing the circular economy: An analysis of 114 definitions, Julian Kirchherr*, Denise Reike, Marko Hekkert, Innovation Studies Group, Copernicus Institute of Sustainable Development, Utrecht University, The Netherlands (https://www.researchgate.net/publication/320074659_Conceptualizing_the_Circular_Economy_An_Analysis_of_114_Definitions)

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By applying the 9R framework, businesses can systematically identify opportunities to reduce resource use, extend product lifespans, and retain value within the economy. In this sense, the 9R framework provides a practical foundation for identifying behavioral changes and development pathways for the furniture sector within a circular economy approach.⁴

2.2. Circular Design Principles

Design is a key enabler of circularity, as decisions made at the earliest stages of product development largely determine a furniture product's durability, reparability, resource efficiency, and end-of-life potential.

Key circular design principles for furniture include:

- Designing for durability and long service life;
- Designing for disassembly and easy repair;
- Using modular components and standardized parts;
- Avoiding unnecessary material complexity;
- Selecting materials with lower environmental impact.

CIRCULAR DESIGN CHECKLIST

- *Use standard fasteners and allow access to them (avoid hidden/permanent joints where possible)*
- *Make high-wear parts replaceable (fronts, legs, upholstery covers, hinges, handles)*
- *Reduce material variety and avoid hard-to-separate composites*
- *Prefer reversible connections over permanent adhesives when feasible*
- *Provide basic product documentation (materials, parts, repair instructions)*
- *Design packaging to be reusable/recyclable and minimize mixed materials*

⁴ ECE/TIM/SP/49, Forestry and Timber Section, Geneva, Switzerland, GENEVA TIMBER AND FOREST STUDY PAPER 49 - Circularity concepts in forest-based industries [Online] Available at: https://unece.org/sites/default/files/2022-05/Circularity%20concepts%20in%20forest-based%20industries%20ECE_TIM_SP_49.pdf

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2.3. Circular Business Models in Furniture Manufacturing

Circular business models⁵ in furniture manufacturing focus on extending product life and keeping materials at their highest value. Typical approaches include repair and spare parts, refurbishment and resale, take-back schemes, and increasing the use of certified and/or recycled materials where feasible.

Several circular business model strategies can be applied in the furniture sector.⁶

2.3.1. Clean loop business models strategy

Clean loop business models are designed around the use of renewable, recyclable, or recycled materials as primary inputs. Value creation is achieved through:

- the use of renewable materials,
- the use of fully recyclable materials, and
- the integration of recycled materials into new furniture products.

2.3.2. Short loop business models strategy

Short loop business models are designed around furniture products manufactured for extended lifespans, with additional value created through services and processes that support product longevity. These models focus on maintaining and enhancing the functional value of products either for the same user or for subsequent users.

Value creation in short loop models is based on:

- manufacturing high-quality, durable, and long-lasting products,
- providing additional services that extend product life for the same user, such as maintenance, repair, and upgrades, and
- applying processes that extend product life for other users, including reuse, refurbishment, and remanufacturing.

⁵ ECE/TIM/SP/49, Forestry and Timber Section, Geneva, Switzerland, GENEVA TIMBER AND FOREST STUDY PAPER 49 - Circularity concepts in forest-based industries [Online] Available at: https://unece.org/sites/default/files/2022-05/Circularity%20concepts%20in%20forest-based%20industries%20ECE_TIM_SP_49.pdf

⁶ FURN 360 coursebook - Circular business training for the furniture and woodworking sectors [Online] Available at: https://ec.europa.eu/programmes/erasmus-plus/project-result-content/15458506-c7ee-470f-a4be-61899a13a741/FURN360_-_coursebook.pdf

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By prioritizing durability and life-extension strategies, short loop models reduce the need for new products and materials while maximizing the value extracted from existing furniture over multiple use cycles.

2.3.3. Access loop business models strategy

Access loop business models are designed around providing access to furniture solutions through leasing, hiring, or renting products, without necessarily involving a change of ownership, or through platforms that enable the maximization of product utilization, which implies:

- Value creation is achieved by delivering a function or result rather than selling a physical product. Furniture products are used by one or multiple customers through leasing, pay-per-use schemes, or other performance-based value capture mechanisms;
- Value creation is achieved through platforms that connect product users (B2B or B2C), providing access to furniture products or services in ways that maximize product utilization.

2.3.4. Cascading loop business models strategy

Cascading loop business model is designed to diversify the use of materials to create new value from coproducts in multiple value chains within and between industries which implies:

- Value creation is based on reusing waste produced by a given production process as input by another production process internally or externally, allowing for multiple value creation from the same material source;
- Value creation is based on a business enlargement strategy since new products are added to the ones currently produced by the company.

2.3.5. Long loop business model strategy

Long loop business model is designed based on recovering already used-resources from existing products in order to extend the value of resource through recycling/integrating these inputs into new products.

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3. Value Chains in a Circular Economy

3.1. Linear and Circular Value Chains

Value chains⁷ describe the sequence of activities through which raw materials are transformed into products and delivered to users. In linear value chains, materials are extracted, processed into products, distributed, used, and ultimately disposed of as waste. Value is primarily generated through product sales, often encouraging relatively short product lifespans and continuous replacement.

Circular value chains keep materials and components in circulation through collaboration between suppliers, manufacturers, retailers, users and recovery partners (repair/refurbishment/recycling). In practice, they require clear rules for product return, sorting and quality, and reverse logistics to enable reuse, refurbishment and recycling.



Figure 4: A traditional forest-based value chain

Circular value chains involve both manufacturing activities and service-based activities, including maintenance, repair, take-back systems, and reverse logistics. Instead of treating end-of-life products as waste, circular value chains view them as potential inputs for new production cycles. Disposal is considered a last resort, while value recovery through secondary markets and material reintegration is prioritized.

An important aspect of circular value chains is the reduction of environmental impacts related to logistics and distribution. Optimized transport, reduced material inputs, and improved coordination between actors along the value chain contribute to lower emissions and higher resource efficiency. Achieving circularity therefore requires cooperation among suppliers, manufacturers, distributors, consumers, and waste management actors, as well as supportive market and regulatory conditions.

⁷ ECE/TIM/SP/49, Forestry and Timber Section, Geneva, Switzerland, GENEVA TIMBER AND FOREST STUDY PAPER 49 - Circularity concepts in forest-based industries [Online] Available at: https://unece.org/sites/default/files/2022-05/Circularity%20concepts%20in%20forest-based%20industries%20ECE_TIM_SP_49.pdf

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3.2. Wood and Furniture Value Chains

Wood-based value chains play a central role in the transition towards a circular economy, as wood is a renewable, bio-based, and biodegradable material with significant potential for reuse and cascading applications. In the furniture sector, wood and wood-based materials form the core of production, while additional materials such as textiles, metals, plastics, adhesives, and coatings contribute to product functionality and aesthetics.

In traditional linear wood and furniture value chains, end-of-life considerations are often overlooked, particularly at early stages of processing. Primary producers typically focus on raw material extraction and initial processing, while waste streams generated downstream are seen as having limited economic value. As a result, large amounts of post-industrial and post-consumer wood are used for low-value applications or energy recovery.

A circular approach to wood and furniture value chains emphasizes design for longevity, reuse, and cascading use of materials. Wood can be used in successive applications, starting with high-value products such as furniture and interior elements, followed by reuse, refurbishment, or transformation into wood-based panels, fiber-based products, and, only at the final stage, energy recovery. This cascading use maximizes resource efficiency and extends the value of wood over multiple life cycles.

The furniture manufacturing value chain typically includes primary processing (raw materials and semi-finished products), secondary processing (manufacturing of furniture), and distribution and use phases. Circular value chains integrate additional activities such as repair, refurbishment, remanufacturing, and collection systems, enabling products and components to re-enter production cycles instead of becoming waste.

However, several challenges limit the circularity of wood and furniture value chains. These include the lack of standardized classification of post-consumer wood, limited collection and sorting infrastructure, variable quality of recovered materials, and insufficient coordination between value chain actors. Overcoming these barriers requires investment in infrastructure, improved cooperation across sectors, and business models that link production, use, and end-of-life management.

By adopting circular value chain approaches, the furniture sector can reduce dependency on virgin raw materials, improve resilience to supply risks, and create new value from materials that would otherwise be discarded. This transformation requires a systemic perspective that connects forestry, manufacturing, design, consumption, and recovery into an integrated circular system.

4. The Role of Wood in a Circular Economy

Wood plays a strategic role in the transition towards a circular economy due to its renewable nature, versatility, and ability to be used across multiple value chains. Forest-based industries are positioned within both the biological and technical cycles of a circular

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economy, enabling them to contribute to solutions addressing global socio-economic and environmental challenges.

4.1. Wood as a Renewable Resource

While wood is a renewable and bio-based material, its environmental performance depends on sustainable forest management practices, product lifespan, and end-of-life pathways. Renewability is not an inherent material property but a system outcome linked to harvesting rates, regeneration capacity, and land-use governance.

In the context of carbon storage, benefits are maximized in long-lived wood products and may be reduced when products are prematurely discarded or directed to energy recovery. Circular strategies are expected to prioritize durability, reuse, and cascading material applications in order to fully realize the climate and resource benefits of wood-based products.

Unlike many conventional materials such as aluminium, steel, glass, and petroleum-based products, wood is not a finite resource and typically requires less energy to produce. Wood-based products and production residues can be reused, recycled, biodegraded, or integrated into cascading systems, supporting efficient material use across multiple industries.

Wood is also highly versatile, as different parts and species of trees can be transformed into a wide range of products - from structural materials and furniture to advanced fiber-based applications. This versatility allows forest-based industries to support circular transitions across several sectors while linking multiple value chains through shared upstream resources.

Nevertheless, increasing the use of wood as a substitute for non-renewable materials requires careful attention to sustainable sourcing and responsible consumption patterns, as unsustainable use can limit the availability of recovered materials and reduce circular potential.

4.2. Cascading Use of Wood

Because wood cannot always be recycled into material of equivalent quality after transformation, maintaining its structural integrity for as long as possible is essential. This is achieved through the principle of cascading use, in which wood is utilized across successive applications, extending its value before final energy recovery.

Typically, the cascade begins in the forest with roundwood, which is primarily processed into solid wood and veneer products such as construction elements and furniture - applications associated with the highest added value and longest service life.

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After the initial lifecycle, the material can be redirected into particle-based products, followed by fiber-based products such as paper and cardboard. Further processing may enable the production of chemical materials, while the final stage involves energy recovery once all material reuse options have been exhausted.

At every level and in every phase of the process, losses occur during collection, sorting, and processing, which represent an unavoidable part of the system.

By ensuring that wood is first used for durable applications and only later for lower-value purposes, cascading systems maximize resource efficiency and extend biomass availability within the economy.

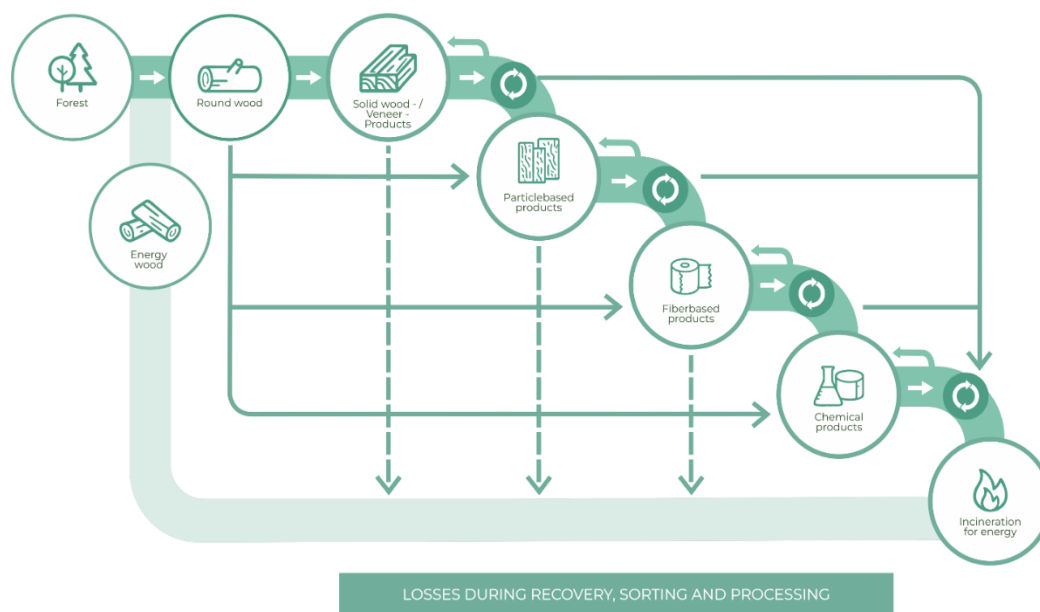


Figure 5: Cascading use of wood ⁸

In practice, cascading use is constrained by progressive material degradation and contamination. Mechanical processing reduces fiber length and strength, while the presence of adhesives, coatings, preservatives, and composite structures may limit the number of technically feasible and environmentally acceptable recycling cycles. Effective cascading therefore requires early design decisions that minimize material complexity and facilitate clean separation at end of life.

⁸ Source: ECE/TIM/SP/49, Forestry and Timber Section, Geneva, Switzerland, GENEVA TIMBER AND FOREST STUDY PAPER 49 - Circularity concepts in forest-based industries [Online] Available at: https://unece.org/sites/default/files/2022-05/Circularity%20concepts%20in%20forest-based%20industries%20ECE_TIM_SP_49.pdf

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Solid wood furniture can be repaired and reused first; then components may be reused or downcycled into panels; finally, remaining wood residues may be used for energy recovery. Keeping wood in higher-value uses as long as possible usually delivers the best environmental outcome

4.3. Limitations and Challenges

Despite its strong circular potential, wood presents several challenges that must be addressed to enable effective cascading systems.

From a technical perspective, wood loses quality during each transformation step and may accumulate contaminants from preservatives, paints, and adhesives. As a result, detecting and sorting wood waste in mixed material streams can be complex and costly.

Market barriers also persist, particularly due to insufficient coordination among actors using wood and its derivatives. Improved cooperation and a clearer understanding of downstream needs are essential for implementing cascading principles successfully.

In addition, the costs associated with collecting, sorting, and cleaning used wood can make recycled material economically comparable to virgin wood, reducing incentives for recovery.

Governance challenges further limit progress, including the absence of an international classification for post-consumer wood and the lack of policy frameworks specifically supporting material reuse. Embedding economic and environmental considerations into regulations is therefore critical for scaling cascading approaches.

Building infrastructure that connects sectors and facilitates material flows is essential to improving material efficiency and ensuring the long-term viability of circular wood systems.

5. Regulatory Framework Relevant to the Furniture Sector

5.1. European Green Deal

The European Green Deal is the EU's overarching strategy to address three interconnected challenges: climate change, biodiversity loss, and pollution.

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In the current policy cycle (2024–2029), the European Commission is committed to:

- achieving climate neutrality by 2050;
- reducing pollution to protect human health, ecosystems, and biodiversity;
- helping companies lead in clean products and technologies;
- supporting a just and inclusive transition for businesses and citizens.

5.2. Key EU policies and initiatives relevant to the furniture sectors

Product requirements and circular design

- Ecodesign for Sustainable Products Regulation (ESPR)
- Digital Product Passport (DPP)
- Empowering consumers for the green transition – Directive
- Right-to-repair (or R2R) Directive

Waste, collection and end-of-life

- Extended Producer Responsibility (EPR) for furniture
- Waste Framework Directive
- Packaging and packaging waste – Regulation

Other

- Green Claims Directive
- Deforestation free products Regulation
- Taxonomy Regulation
- Green Public Procurement criteria
- Corporate Sustainability Reporting Directive (CSRD)
- The Chemicals Strategy

6. Sustainable Materials for Furniture Production

Material selection plays a critical role in enabling circular furniture systems, as it directly influences product durability, recyclability, environmental impact, and long-term value retention. In the transition toward a circular economy, the furniture industry is shifting from linear production models to regenerative systems that prioritize sustainability, resource efficiency, and product longevity.

The materials presented in this chapter were selected to provide companies, designers, and students with clear and practical options for producing sustainable and recyclable furniture. Experimental solutions were deliberately excluded in order to ensure that the guidelines

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remain realistic and applicable for small and medium-sized enterprises operating in the furniture sector.

Each material is considered from the perspective of its potential integration into existing production processes or its ability to support the development of new circular business models.

6.1. Locally Relevant Wood Species

Local wood species offer important advantages for circular furniture production, including reduced transport-related emissions, stronger supply security, and support for regional economic development. Many commonly used species, as well as climate-resilient alternatives, demonstrate strong potential when integrated into circular production systems.

Within the FULAR project, partners identified wood species most relevant for sustainable furniture manufacturing in the Adriatic–Ionian region, based on desk research and stakeholder input. The selection reflects industrial relevance, typical applications (solid wood and upholstered furniture), and potential to support circular and climate-resilient production.

These species include:

- European beech (*Fagus sylvatica* L.)
- Oak (*Quercus robur* L., *Quercus petraea*)
- Walnut (*Juglans regia* L.)
- Common ash (*Fraxinus excelsior* L.)
- Silver fir (*Abies alba* Mill.)
- Norway spruce (*Picea abies* Karst.)
- Lime (*Tilia* spp.)
- Chestnut (*Castanea sativa* Mill.)
- Poplar (*Populus* spp.)
- European larch (*Larix decidua* Mill.)

In addition, several less commonly used species show promising potential for future furniture manufacturing and supply diversification:

- Sycamore maple (*Acer pseudoplatanus* L.)
- Scots pine (*Pinus sylvestris* L.)
- Black alder (*Alnus glutinosa* (L.) Gaertn.)
- Cherry (*Prunus avium* L.)
- Olive (*Olea europaea* L.)

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6.1.1. Core Regional Wood Species in the Furniture Industry

Table 1: Overview of most commonly used regional wood species in the furniture industry

Wood species	Key characteristics	Typical furniture use	Circular potential
European beech (<i>Fagus sylvatica</i> L.)	Hard, fine and even texture; excellent steam-bending; machines and finishes cleanly	Bentwood furniture, seating components, tables, veneers, modular furniture	High – strong, widely reusable, suitable for cascading into panels and engineered products
Oak (<i>Quercus robur</i> L., <i>Quercus petraea</i>)	Hard, strong and naturally durable; attractive grain; resistant to wear and decay	Solid wood furniture, flooring, staircases, veneers, interior finishes	Very high – long lifespan supports reuse and refurbishment
Walnut (<i>Juglans regia</i> L.)	Medium-to-heavy wood with rich appearance and fine grain; easy to process and polish	High-quality furniture, cabinetry, veneers, interior elements	High – premium products typically remain in long-term use
Common ash (<i>Fraxinus excelsior</i> L.)	Tough hardwood with excellent strength-to-weight ratio and shock resistance; steam-bendable	Chair frames, table tops, flooring, joinery, veneers	High – durability and toughness enable repair and extended use
Silver fir (<i>Abies alba</i> Mill.)	Light, soft wood with good dimensional stability; easy to machine; low natural durability	Lightweight furniture, drawer sides, back panels, hidden structural elements	Medium – suitable mainly for interior applications
Norway spruce (<i>Picea abies</i> Karst.)	Light, soft, elastic wood; easy to work; moderate durability	Lightweight furniture, frames, panels, joinery boards, interior cladding	Medium – efficient material use but limited durability for heavy-use furniture
Lime (<i>Tilia</i> spp.)	Homogeneous, fine texture; highly workable; very low natural durability	Carved elements, toys, models, frames, core plywood material	Low-medium – best suited for interior and non-load applications
Sweet chestnut (<i>Castanea sativa</i> Mill.)	Moderately heavy with high natural durability and dimensional stability	Solid furniture, cabinet elements, flooring, interior joinery	High – durability comparable to oak supports long service life
Poplar (<i>Populus</i> spp.)	Lightweight, easy to machine and finish; low durability	Plywood, upholstered frames, painted furniture, low-value cabinetry	Medium – ideal for engineered products but limited lifespan
European larch (<i>Larix decidua</i> Mill.)	Strong with good mechanical properties; naturally resistant; distinct texture	Solid furniture, flooring, stairs, outdoor furniture	High – durability and structural performance support reuse

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6.1.2. Less Common Used Wood Species in the Furniture Industry in Region

Table 2: Overview of less common used regional wood species in the furniture industry

Wood species	Key characteristics	Typical furniture use	Circular potential
Sycamore maple (Acer pseudoplatanus L.)	Moderately hard with fine, even texture; good strength and wear resistance; low natural durability but easily impregnated	High-quality furniture, veneers, decorative panels, joinery, flooring	Medium – strong but limited by low natural durability
Scots pine (Pinus sylvestris L.)	Soft to medium-hard; straight grain; moderately durable; highly permeable for preservative treatments	Solid furniture, components, veneered panels, flooring, interior joinery	Medium-high – treatment improves lifespan and reuse potential
Black alder (Alnus glutinosa)	Light to medium-weight; uniform texture; excellent machining and finishing; low outdoor durability	Solid and modular furniture, cabinetry, veneers, mouldings, decorative objects	Medium – best suited for interior long-term applications
Cherry (Prunus avium L.)	Moderately hard with fine structure; good strength and elasticity; smooth machining; moderate durability	High-end furniture, cabinetry, veneers, interior joinery, decorative elements	High – traditionally used for long-lasting premium furniture
Olive (Olea europaea L.)	Very hard, dense and decorative; moderately durable; slow drying; difficult machining	Small high-end furniture, inlays, carving, turned items, artisanal products	High – exceptional longevity and high-value reuse

Among the analyzed materials, traditional deciduous species were recognized by most partners as particularly suitable for advancing circular economy practices in the furniture industry. Due to their mechanical reliability, availability, and capacity to support long product lifespans, European beech and oak were identified as priority materials for circular furniture manufacturing

European beech (*Fagus sylvatica L.*)

European beech is one of the most important hardwood species in Europe, widely available and strongly embedded in regional furniture value chains. It grows best on well-drained soils and maintains solid growth rates, although future distribution may shift due to climate change.

Beech is a hard, moderately heavy wood with a fine and uniform texture that allows high-quality surface finishing. Its excellent steam-bending properties make it particularly suitable for curved components, supporting both functional and design flexibility in furniture production. The material machines easily and performs reliably in a wide range of

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applications, from structural elements to decorative veneers. Despite its relatively low natural durability, beech can be effectively treated, extending its service life and enabling long-term use.

From a circular economy perspective, beech demonstrates strong potential due to its reparability, adaptability, and efficient material utilization. Production residues such as off-cuts and chips are commonly redirected into particleboard, MDF, and bioenergy streams, supporting cascading use. Additionally, solid beech components are well suited for refurbishment and remanufacturing, contributing to extended product lifecycles and reduced dependence on virgin resources.

Oak (Quercus robur L., Quercus petraea)

Oak is among the most valued European hardwoods, recognized for its strength, durability, and long service life. It thrives across diverse ecological conditions and plays a major role in both traditional and contemporary furniture manufacturing.

Characterized by dense structure and distinctive grain patterns, oak provides strong visual appeal alongside excellent mechanical performance. The wood machines well but requires controlled drying to prevent defects. Its natural resistance to wear and decay makes it particularly suitable for high-quality furniture, flooring, and load-bearing components.

Oak aligns exceptionally well with circular economy principles. Its durability supports multiple product lifecycles, as furniture can often be repaired, refinished, or repurposed rather than replaced. Lower-grade material is frequently reprocessed into engineered wood products, while post-industrial off-cuts can be reintegrated into production systems.

Recovered structural elements from end-of-life oak furniture also represent high-value resources for reuse, reinforcing regenerative material flows within the furniture sector.

Together, beech and oak illustrate how traditional hardwood species can support circular production models by combining durability, reparability, and strong reuse potential.

6.1.3. Emerging Climate-Resilient Species

Climate trends suggest that drought-tolerant species may become more important in parts of Europe. For the furniture sector, this means monitoring future availability and testing selected “species of the future” for targeted applications (e.g., durable oaks for high-wear uses and oriental beech for interior applications), while ensuring responsible sourcing.

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Table 3: Overview of potential future emerging climate-resilient wood species

Species	Strategic advantage	Why it matters
Hungarian oak	Drought tolerant	Likely to expand with climate change
Holm oak	Extremely durable	Suitable for high-wear furniture
Downy oak	Thrives in dry soils	Supports future forest resilience
Valonia oak	Strong and stable	Untapped hardwood potential
Oriental beech	Excellent mechanical properties	Important future structural material

6.2. Sustainable materials

In the transition toward a circular economy, the furniture industry is undergoing a profound transformation - shifting from linear production models to regenerative systems that prioritize sustainability, resource efficiency, and product longevity. This evolution is driven by the integration of innovative materials and enabling technologies of various effectiveness when it comes to the “circularity” issue. FULAR consortium has made an effort to outline materials that underpin circular practices in furniture manufacturing, offering scalable solutions for reducing environmental impact while enhancing economic resilience. References to materials and technologies still in the experimental stage were deliberately excluded to ensure that the guidelines remain practical, realistic, and readily applicable for MSMEs operating in the furniture sector.

Each identified material and technology are presented from the aspect of potential integration in the current or development of completely new business model of MSMEs active in the furniture sector.

6.2.1. CHIPBOARD (CONVENTIONAL & RECYCLED)

Best for	Circular value	DO	AVOID	BUSINESS TIP
<ul style="list-style-type: none"> • Cabinets • Carcasses • Shelving 	High waste recovery potential	<ul style="list-style-type: none"> • Identify each furniture component • Use recycled content • Design for disassembly • Control emissions 	<ul style="list-style-type: none"> • Mixed laminates • Non-recyclable coatings 	Recycled chipboard offers the fastest circular upgrade with minimal redesign

CHECKLIST



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- Use chipboard with verified recycled content
- Design panels for easy disassembly
- Establish return or recycling agreements with suppliers and buyers
- Request E0/E1 emission certification⁹
- Separate clean wood waste during production
- Avoid unnecessary surface laminations that hinder recycling

6.2.2. RECYCLED MDF (rMDF)

Best for	Circular value	DO	AVOID	BUSINESS TIP
<ul style="list-style-type: none"> • Fronts • Decorative elements 	Medium-high with proper sourcing	<ul style="list-style-type: none"> • Identify each furniture component • Use for non-structural parts • Combine fibers strategically 	<ul style="list-style-type: none"> • Overloading recycled fibers • High VOC adhesives and coatings 	Ideal for visible parts where smooth finish matters

CHECKLIST

- Source MDF with documented recycled fiber content
- Match rMDF to non-structural applications
- Combine virgin and recycled fibers where needed
- Ensure low-VOC¹⁰ adhesives are used
- Plan internal MDF waste collection
- Communicate rMDF use transparently to customers

6.2.3. SOLID WOOD PANELS

Best for	Circular value	DO	AVOID	BUSINESS TIP
<ul style="list-style-type: none"> • Premium • Long-life furniture 	Very high	<ul style="list-style-type: none"> • Identify each furniture component • Use certified wood 	Over-engineering short-life products	Longevity is your strongest sustainability argument

⁹ E0 / E1 Emission Certification in Chipboard Materials. These labels describe how much formaldehyde a wood-based panel (like chipboard/particleboard, MDF, HDF, plywood) emits. Formaldehyde is a volatile organic compound (VOC). E1 - The Standard European Class. E0 is not an official EU standard, but a stricter, industry-driven category used by manufacturers who want to show very low emissions.

¹⁰ Volatile organic compound (VOC) is simply an organic chemical that easily evaporates into the air at room temperature



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- Enable repair and refinishing

CHECKLIST

- | | |
|--|--|
| <input type="checkbox"/> Use FSC/PEFC-certified wood | <input type="checkbox"/> Maximize use of finger-jointed panels |
| <input type="checkbox"/> Design furniture for repair and refinishing | <input type="checkbox"/> Offer spare parts and replacement components |
| <input type="checkbox"/> Use bio-based or low-impact adhesives | <input type="checkbox"/> Promote long-life value instead of fast replacement |

6.2.4. CROSS-LAMINATED TIMBER (CLT)

Best for	Circular value	DO	AVOID	BUSINESS TIP
<ul style="list-style-type: none"> • Modular • Structural furniture 	High carbon storage	<ul style="list-style-type: none"> • Identify each furniture component • Use modular design • Source locally 	Heavy surface treatments	CLT differentiates your brand through innovation and scale

CHECKLIST

- | | |
|---|---|
| <input type="checkbox"/> Use CLT for modular or structural furniture | <input type="checkbox"/> Source timber from local or regional suppliers |
| <input type="checkbox"/> Apply CNC or digital fabrication to reduce waste | <input type="checkbox"/> Design components for reuse or reconfiguration |
| <input type="checkbox"/> Use low-VOC surface treatments | <input type="checkbox"/> Educate customers on CLT benefits |

6.2.5. RECYCLED PLASTICS

Best for	Circular value	DO	AVOID	BUSINESS TIP
<ul style="list-style-type: none"> • Shells • Connectors • Accessories 	High when mono-material	<ul style="list-style-type: none"> • Identify each furniture component • Use rPP, rPET • Design for recycling 	Mixed plastics	Color variation signals authenticity, not defect

CHECKLIST

- | | |
|---|--|
| <input type="checkbox"/> Use rPP, rPE, or rPET ¹¹ where possible | <input type="checkbox"/> Avoid mixing incompatible plastic types |
| <input type="checkbox"/> Design components as mono-material | <input type="checkbox"/> Collect plastic offcuts separately |
| <input type="checkbox"/> Work with recyclers for stable supply | <input type="checkbox"/> Accept color variation as part of circular design |

¹¹ Recycled Polypropylene, Recycled Polyethylene, Recycled Polyethylene Terephthalate



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6.2.6. WOOD PLASTIC COMPOSITES (WPC)

Best for	Circular value	DO	AVOID	BUSINESS TIP
Outdoor furniture	High durability	<ul style="list-style-type: none"> Identify each furniture component Use recycled inputs Test UV resistance 	Ignoring end-of-life planning	Low maintenance equals long customer satisfaction

CHECKLIST

- Use WPC¹² for outdoor or high-wear furniture
- Test UV and moisture resistance
- Plan end-of-life recycling routes
- Verify recycled content in both wood and plastic
- Design profiles for durability and repair
- Communicate low-maintenance benefits

6.2.7. TEXTILES & UPHOLSTERY

Best for	Circular value	DO	AVOID	BUSINESS TIP
<ul style="list-style-type: none"> Seating Soft furniture 	Medium, design-dependent	<ul style="list-style-type: none"> Identify each furniture component Modular upholstery Recycled or natural fibers 	Permanent bonding	Design upholstery as a service, not a disposable layer

CHECKLIST

- Use recycled or natural fibers
- Design upholstery for easy removal
- Avoid toxic coatings and flame retardants
- Prefer mono-material fabrics
- Use recycled or bio-based foams
- Offer reupholstery and repair services

6.2.8. BIO-BASED AUXILIARY PRODUCTS

Best for	Circular value	DO	AVOID	BUSINESS TIP
All furniture types	System-wide impact	<ul style="list-style-type: none"> Identify each furniture component Use low-VOC products Enable refinishing 	Toxic additives	Invisible materials shape customer health and trust

¹² Wood-Plastic Composite

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CHECKLIST

- | | |
|--|---|
| <input type="checkbox"/> Use water-based, low-VOC coatings | <input type="checkbox"/> Test bio-based adhesives in production |
| <input type="checkbox"/> Ensure compatibility with recycling processes | <input type="checkbox"/> Request SDS ¹³ and environmental declarations |
| <input type="checkbox"/> Choose finishes that allow refinishing | <input type="checkbox"/> Communicate health benefits to customers |

6.3. Post-Industrial Wood Materials

Furniture manufacturing generates valuable wood residues (e.g., sawdust, shavings, chips, offcuts, veneer trimmings and sanding dust) that can be reintegrated into production cycles. Clean and homogeneous residues can support higher-value uses (e.g., panels, components, bio-composites) and, where appropriate, energy recovery.

The key for circularity is early separation and keeping streams clean (traceability, quality control and low-emission adhesives/coatings), which increases both reuse potential and economic value.

The following table provides an overview of different wood by-products and waste and their potential applications in manufacturing:

Table 4: Overview of different wood by-products and waste and their potential applications in manufacturing

Material	Potential Usability in Furniture & Wood Product Manufacturing	
Sawdust	<ul style="list-style-type: none"> MDF, particleboard Fiberboard Bio-composites and wood-plastic composites 	<ul style="list-style-type: none"> Briquettes or pellets Wood filler or putty
Wood Shavings	<ul style="list-style-type: none"> Lightweight particleboard Wood wool boards (insulation, acoustics) 	<ul style="list-style-type: none"> Briquettes or bedding Mulch or decorative filler
Wood Chips	<ul style="list-style-type: none"> OSB boards, chipboard Bio-composites 	<ul style="list-style-type: none"> Wood cement boards, insulating panels
Bark	<ul style="list-style-type: none"> Filler in composites Insulation material 	<ul style="list-style-type: none"> Natural adhesives (tannin-based)
Offcuts (Solid Wood)	<ul style="list-style-type: none"> Finger-jointed panels, blockboards Furniture frames, legs, drawers 	<ul style="list-style-type: none"> Composite panel core
Trim Waste (Edges, Beams)	<ul style="list-style-type: none"> Laminated panels Small wood components 	<ul style="list-style-type: none"> Chipboard or OSB feedstock
Reclaimed Wood	<ul style="list-style-type: none"> Rustic-style furniture Reprocessed flooring, paneling 	<ul style="list-style-type: none"> Low-grade particleboard

¹³ Safety Data Sheet - An SDS is a standardized document that provides all essential safety information about a chemical substance, mixture, adhesive, coating, resin, or industrial material

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MDF/HDF/PB Trimmings	<ul style="list-style-type: none"> Recycled composite boards Core for laminated panels 	<ul style="list-style-type: none"> Furniture drawer bottoms, backs
Plywood Waste	<ul style="list-style-type: none"> Furniture frames, drawers Plywood-reinforced composites 	<ul style="list-style-type: none"> Engineered panel feedstock
Laminated Panel Scrap	<ul style="list-style-type: none"> Reconstituted particleboard core Laminated sandwich panels 	<ul style="list-style-type: none"> Mosaic or accent tiles
Edge Banding Waste	<ul style="list-style-type: none"> Re-extruded edge banding Filler in WPCs 	<ul style="list-style-type: none"> Decorative trims or inlays
Veneer Offcuts	<ul style="list-style-type: none"> Inlays, marquetry Veneered surface panels 	<ul style="list-style-type: none"> Composite facing layers
Sanding Dust	<ul style="list-style-type: none"> Filler in adhesives, wood putties Lightweight panels 	<ul style="list-style-type: none"> Surface coatings, fire-resistant boards
CNC Router Dust	<ul style="list-style-type: none"> Precision bio-composites Bio-resin or WPC injection molding 	<ul style="list-style-type: none"> Fuel pellets
Wood Ash	<ul style="list-style-type: none"> Cement-bonded particleboards Bio-cementitious composites 	<ul style="list-style-type: none"> (Non-furniture: soil amendment)

From the above presented "post-industrial wood raw materials", solid wood off-cuts are identified as the material to be strongly considered for processing in line with the circular economy strategies (9R approach).

6.4. Reused Components from End-of-Life Furniture

Furniture reaching the end of its initial use phase often contains components and assemblies that retain significant functional, structural, and aesthetic value. Frames, panels, hardware, upholstery elements, and mechanical systems are frequently designed to withstand long-term loads and repeated use, making them well-suited for reuse, refurbishment, or reintegration into new furniture products.

Across different furniture categories - seating, tables, storage units, beds, office, kitchen, and outdoor furniture - many components can be selectively recovered and reused. Structural elements such as solid wood frames, metal bases, legs, slats, and carcasses often remain mechanically sound. Functional components including hinges, drawer runners, gas lifts, recliner mechanisms, and adjustable systems can be restored or upgraded. Surface and comfort elements, such as upholstery covers, cushions, tabletops, and fronts, can be replaced or renewed while preserving the underlying structure.

The reuse of structural components from end-of-life furniture requires inspection for biological degradation, mechanical fatigue, and previous chemical treatments. Factors such as fungal decay, insect damage, moisture-induced degradation, and old surface treatments may affect both structural performance and compliance with current health and safety standards. For this reason, appropriate assessment is essential before reintegration into new products.

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Reusing components supports circular production by extending product lifespans, reducing demand for virgin materials, and lowering embodied environmental impact. It also enables cost-effective repair, customization, and modular upgrades, allowing furniture to adapt to changing user needs rather than being fully replaced. When combined with thoughtful design - such as standardized fittings, reversible connections, and accessible fasteners - component reuse becomes a scalable and repeatable practice.

An important enabler of component reuse is material awareness and compatibility. Understanding the original materials, construction methods, and connection systems allows manufacturers, refurbishers, and repair networks to safely reintegrate components into new or existing products. The use of ecologically preferable replacement materials, such as FSC-certified wood, recycled metals, bio-based foams, and low-emission panels, further strengthens circular outcomes when components require partial renewal.

By treating furniture not as a single disposable object but as a collection of valuable, reusable components, the furniture sector can shift toward more resilient, adaptable, and resource-efficient production models - where longevity, repairability, and reuse are integral to design and business strategy.

Tip: Focus first on components with the highest reuse value (solid wood frames, metal bases, quality hardware, and mechanisms). Soft elements (foams, textiles) are often better replaced than reused

Typical end-of-life components per specific types of furniture are presented in the following sections.

6.4.1. Sofas / Seating

Sofa / Couch	Armchair	Recliner	Dining Chair / Side Chair
<p>Frame: Usually hardwood (eg. beech, oak) or metal (steel, aluminum)</p> <p>Suspension: Webbing (elastic belts), sinuous springs (steel)</p> <p>Cushioning: Foam (polyurethane), down/feather, polyester fiberfill</p>	<p>Similar components as sofa, usually in a single-seating format</p>	<p>Reclining mechanism: (metal, plastic gears), motor for electric versions</p>	<p>Frame: Wood, metal, plastic</p> <p>Seat: Upholstered (fabric/leather), wood, plastic.</p> <p>Backrest: Solid or upholstered</p>

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<p>Upholstery: Fabric (cotton, linen, polyester), leather (genuine or synthetic)</p> <p>Legs: Wood, metal or plastic</p>			
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6.4.2. Tables

Dining Table	Coffee Table	Side/End Table	Console Table
<p>Top: Solid wood, veneer overlaid engineered wood, glass, marble or laminate</p> <p>Legs/Base: Solid wood, metal, engineered wood</p>	<p>Same as dining tables but smaller and lower</p> <p>Often includes shelves or drawers (plywood, coated MDF or veneer overlaid MDF)</p>	<p>Small accent tables; same material as Dining table</p> <p>Often includes shelves or drawers (plywood, coated MDF or veneer overlaid MDF)</p>	<p>Top: Solid wood, veneer overlaid engineered wood, glass, marble or laminate</p> <p>Legs/Base: Solid wood, metal, engineered wood</p> <p>Often includes shelves or drawers (plywood, coated MDF or veneer overlaid MDF)</p> <p>Narrow, used in hallways; often features drawers or shelves</p>

6.4.3. Beds

Bed Frame	Mattress Base (Box Spring / Foundation)	Bunk Bed / Loft Bed
<p>Headboard/Footboard: Wood, upholstered (foam and fabric), metal</p> <p>Side Rails & Slats: Solid wood, engineered wood, metal</p>	<p>Structure: Wood frame with metal springs (box spring) or solid base (foundation)</p> <p>Covering: Fabric</p>	<p>Structure: Mostly metal or solid wood, with guardrails and ladders</p>

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Legs: Wood or metal		
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6.4.4. Storage Units

Wardrobe	Cabinet	Chest of Drawers	Bookshelf
<p>Panels: Solid wood, MDF/particleboard with veneer or laminate</p> <p>Back Panel: Plywood or thin hardboard</p> <p>Doors: Hinged or sliding; same as panels or MDF</p> <p>Shelves: Engineered wood, particle board or glass</p> <p>Hinges/Rails: Steel or aluminum</p>	<p>Similar to wardrobes but smaller; kitchen or living room use</p>	<p>Carcass: Solid or engineered wood</p> <p>Drawer Runners: Metal or plastic</p> <p>Knobs/Pulls: Metal, wood, ceramic, plastic</p>	<p>Open frame: Wood, metal or glass shelves</p>

6.4.5. Office / Commercial Furniture

Office Desk	Office Chair	Reception Desk / Counter
<p>Top: Solid wood, MDF or particleboard with laminate or veneer</p> <p>Frame/Legs: Metal or wood</p> <p>Drawer Runners: Metal or plastic</p>	<p>Base: Nylon, aluminum or steel with casters</p> <p>Seat & Backrest: Foam with mesh, leather or fabric cover</p> <p>Mechanism: Gas lift, tilt and height adjustment (metal/plastic)</p>	<p>Larger, often custom made; wood or composite with laminate, metal details</p>

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6.4.6. Outdoor Furniture

Patio Chair / Lounge	Outdoor Table	Bench / Swing / Hammock Stand
<p>Frame: Aluminum, steel (often powder coated), teak, plastic (polypropylene)</p> <p>Seating Surface: Mesh fabric (textilene), plastic slats, wood slats or cushions</p> <p>Cushions: Outdoor rated fabric (acrylic, polyester), quick-dry foam</p>	<p>Top: Glass, wood (teak, eucalyptus), metal or HDPE</p> <p>Frame: Same as Patio chair / Lounge</p>	<p>Often wood (treated), metal or synthetic rattan</p>

6.4.7. Kitchen Furniture

Kitchen Cabinets	Kitchen Island	Pantry Units
<p>Carcass: Plywood, particleboard or MDF with melamine/laminate</p> <p>Fronts: Solid wood, coated/veneered/thermofoiled MDF</p> <p>Countertop: Laminate, solid wood, stone (granite, quartz), composite (Corian)</p> <p>Handles/Hinges: Metal (stainless steel, zinc alloy)</p>	<p>Same as cabinets, may include seating, drawers, sinks, electrical accessories</p>	<p>Tall cabinet-style storage; made like regular kitchen cabinets</p>

6.5. Repair-Oriented Circularity in Furniture

A closely related and equally important concept is repair, which plays a decisive role in extending product lifespans and preserving the value of reusable components. During everyday use or due to external influences such as moisture, mechanical stress, or environmental exposure, furniture may experience physical or aesthetic deterioration. Repair interventions allow damaged elements to be restored or selectively replaced while maintaining the integrity of the overall structure and function.

Typical repair actions include reinforcing or partially replacing wooden or metal frames, renewing suspension systems and cushioning, reupholstering worn surfaces, tightening or replacing legs and joints, and refinishing or replacing tabletops, panels, and work surfaces. Functional components such as drawer runners, hinges, recliner mechanisms, gas lifts, and

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casters can often be cleaned, lubricated, adjusted, or replaced individually, enabling continued use without full product replacement.

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Table 5: Overview of the most common types of damage of furniture, as well as the repair methods for each case

Furniture Component	Material	Possible Damage	Cause of Damage	Replacement or Fix
Sofa Frame	Wood/Metal	Cracks, warping, rust	Moisture, overload, age	Replace damaged frame section or reinforce
Sofa Suspension	Springs/Webbing	Sagging, breakage	Wear and tear, heavy use	Replace springs or webbing
Sofa Cushioning	Foam	Compression, deformation	Long-term use	Replace cushion inserts
Sofa Upholstery	Fabric/Leather	Tears, stains, fading	Pets, spills, sunlight	Reupholster or replace covers
Sofa Legs	Wood/Metal/Plastic	Breakage, wobbling	Impact, overload	Replace legs or tighten screws
Dining Table Top	Wood/Glass/Marble	Scratches, stains, cracks	Heat, impact, moisture	Sand and refinish, replace top
Table Legs	Wood/Metal	Loose joints, bending	Frequent movement, heavy load	Reinforce or replace legs
Bed Frame	Wood/Metal	Creaking, structural damage	Weight stress, age	Reinforce joints or replace frame
Slats	Wood/Metal	Breaking, bending	Jumping, overload	Replace individual slats
Headboard	Wood/Upholstered	Loosening, fabric wear	Leaning, friction	Tighten bolts, reupholster
Wardrobe Panel	Wood/MDF	Warping, delamination	Humidity, poor construction	Replace panel or cover with laminate
Drawer Runners	Metal/Plastic	Jamming, breakage	Overloading, dirt	Clean, lubricate or replace runners
Back Panel	Hardboard	Detachment, bending	Movement, poor fastening	Nail or screw in place or replace
Desk Top	Wood/Laminate	Scratches, swelling	Water, wear	Refinish or replace top
Office Chair Base	Metal/Plastic	Wheel breakage, cracks	Rolling fatigue, impact	Replace base or casters
Chair Upholstery	Mesh/Fabric	Tears, sagging	Prolonged use	Replace fabric or mesh
Patio Frame	Metal/Wood/Plastic	Rust, rot, cracking	Weather exposure	Treat rust, seal wood, replace parts
Cushions	Outdoor Fabric	Fading, mildew	Sunlight, rain	Replace with weather-resistant material



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Table Top	Glass/Wood	Shattering, staining	Impact, weather	Replace top
Cabinet Carcass	MDF/Particleboard	Swelling, delamination	Moisture, leaks	Replace carcass or panels
Countertop	Laminate/Stone	Burns, chipping	Hot pans, impact	Resurface or replace
Drawer Handles	Metal/Plastic	Loosening, breakage	Frequent use	Tighten or replace handles

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From a circular perspective, repair is most effective when combined with the use of ecologically preferable replacement materials. Structural components can be renewed using FSC-certified hardwood, reclaimed wood, bamboo, or recycled steel and aluminum. Comfort and surface elements benefit from natural latex foams, recycled cotton batting, organic textiles, recycled PET fabrics, and eco-leather alternatives. Panels and carcasses can be replaced with formaldehyde-free MDF, FSC-certified plywood, or reclaimed solid wood, while hardware and fittings are well suited to recycled metals or bio-based reinforced plastics.

Design choices strongly influence repairability and reuse potential. Furniture that incorporates standardized components, accessible fasteners, modular construction, and reversible connections enables faster repairs, easier component replacement, and higher reuse rates. When repair strategies are supported by material transparency and clear documentation, components can be safely reintegrated into new or existing furniture systems.

However, furniture designed with irreversible joints, excessive material bonding, or non-standard fittings significantly limits repair potential and reduces the achievable service life extension.

By embedding repair and component reuse into design, production, and service models, the furniture sector can significantly reduce material demand, lower environmental impact, and create adaptable products that evolve with user needs. Repair-oriented circularity transforms furniture into a long-term asset - where durability, renewability, and responsible material choices define value over time.

Table 6: Overview of the proposals about the materials that can be used to produce the components that need to be replaced, or is damaged

Furniture Component	Best Ecological Replacement
Sofa Frame	FSC-certified hardwood or recycled steel
Sofa Suspension	Natural jute webbing or recycled steel springs
Sofa Cushioning	Natural latex foam or recycled cotton batting
Sofa Upholstery	Organic cotton, hemp, or eco-leather
Sofa Legs	Sustainably sourced wood or recycled metal
Dining Table Top	Reclaimed wood, bamboo, or recycled glass
Table Legs	Reclaimed wood or bamboo
Bed Frame	FSC-certified wood or recycled metal
Slats	Bamboo or recycled steel slats
Headboard	Recycled wood or organic upholstered materials
Wardrobe Panel	Formaldehyde-free MDF or solid reclaimed wood
Drawer Runners	Recycled metal runners
Back Panel	Recycled hardboard or plywood

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Desk Top	Bamboo or eco-laminate over formaldehyde-free plywood
Office Chair Base	Recycled aluminium or bio-based reinforced plastic
Chair Upholstery	Recycled mesh or natural wool fabrics
Patio Frame	Recycled plastic lumber or FSC-certified teak
Cushions	Recycled PET fabric or natural latex foam
Outdoor Table Top	Recycled glass or sealed reclaimed wood
Cabinet Carcass	FSC-certified plywood or formaldehyde-free particleboard
Countertop	Recycled glass composite or sustainably harvested wood
Drawer Handles	Recycled metal or bamboo

From the above presented “reused components from end-of-life furniture”, various components and surfaces of solid wood furniture, including the structural elements and wooden frames (e.g. from upholstery furniture), are identified as the high potential materials to be used (processed) in line with the circular economy strategies (9R approach).

7. Digital tools for circular economy in furniture sector

The furniture industry, traditionally reliant on resource-intensive production processes, is undergoing a significant transformation through the adoption of digital software, devices, and platforms. These technological solutions are not only improving efficiency and competitiveness but also supporting the shift towards a circular economy model. Digital design and simulation tools enable companies to optimize material use, reduce waste, and create products designed for durability, repair, and recycling. Advanced manufacturing technologies, such as CNC machining, robotics, and additive manufacturing, facilitate precision production with minimal resource consumption. At the same time, digital platforms for product lifecycle management, material tracking, and reverse logistics strengthen circular practices by extending product life and encouraging reuse. Emerging devices, including sensors and IoT-enabled solutions, provide real-time data on product performance, enabling predictive maintenance and more sustainable consumption patterns. By integrating these digital innovations, the furniture industry can enhance resource efficiency, minimize environmental impact, and align more closely with circular economy principles, paving the way for a more sustainable future of production and consumption.

Digital tools and platforms act as enablers of circular strategies. Their effectiveness depends on underlying material choices, design decisions, production processes, and business models. Digitalization is recommended to apply in support of clearly defined circular objectives rather than operating independently.

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7.1. Software supporting circularity of furniture sector

The adoption of specialized software is transforming how the furniture industry approaches circularity. From parametric design tools that enable modularity and disassembly, to lifecycle assessment (LCA) software that quantifies environmental impact, these digital solutions empower manufacturers to embed sustainability into every stage of production. Material tracking systems, waste analytics, and repair optimization software further support closed-loop strategies by enhancing resource efficiency and enabling data-driven decision-making. By integrating these tools into design, manufacturing, and post-use phases, companies can accelerate their shift toward regenerative models while meeting evolving regulatory and market demands. Throughout the mapping process, FULAR partnership has identified and structured following types of software applicable in furniture industry, contributing to the concept of circular economy – Design & Optimization; Lifecycle Transparency Product Traceability; Reuse, Repair & Modular Assembly; and Lifecycle Assessment & Decision Support.

7.1.1. Design & optimization software

Purpose	Supports circular actions	Typical tools	Key benefits	BUSINESS TIP
Enable circular-ready furniture through precision, modularity, and waste reduction	<ul style="list-style-type: none"> Redesign Reduce Optimize Repair 	<ul style="list-style-type: none"> IMOS iCAD Optimik Deepnest Maestro CNC Spazio3D SWOOD 	<ul style="list-style-type: none"> Reduced offcuts and scrap Higher material yield Faster design-to-production cycles 	Start with nesting and cutting optimization - it delivers immediate cost and waste savings

CHECKLIST

- | | |
|---|---|
| <input type="checkbox"/> Use CAD/CAM tools that support parametric and modular design | <input type="checkbox"/> Apply nesting and cutting optimization to reduce panel waste |
| <input type="checkbox"/> Integrate software directly with CNC machines | <input type="checkbox"/> Avoid over-ordering materials |
| <input type="checkbox"/> Use digital simulations to test design changes before production | <input type="checkbox"/> Prioritize software already used by suppliers or Partners |

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7.1.2. Lifecycle transparency & product traceability software

Purpose	Supports circular actions	Typical tools	Key benefits	BUSINESS TIP
Track materials and components to enable reuse, repair, and recycling	<ul style="list-style-type: none"> • Rethink • Reuse • Recycle • Redesign 	<ul style="list-style-type: none"> • Digital Product Passports • BIM platforms • Digital Twins • ERP systems 	<ul style="list-style-type: none"> • Regulatory compliance • Improved material accountability • Foundation for take-back schemes 	Even basic QR-based tracking prepares your company for future EU requirements

CHECKLIST

- | | |
|--|---|
| <input type="checkbox"/> Track materials and components across the product lifecycle | <input type="checkbox"/> Use digital product passports or QR-based identification |
| <input type="checkbox"/> Store material and component data for future reuse or recycling | <input type="checkbox"/> Ensure compliance with EU Ecodesign and reporting requirements |
| <input type="checkbox"/> Integrate traceability tools with ERP or BIM systems | <input type="checkbox"/> Prepare for take-back and refurbishment Programs |

7.1.3. Reuse, repair & modular assembly software

Purpose	Supports circular actions	Typical tools	Key benefits	BUSINESS TIP
Enable furniture systems that can be assembled, disassembled, and upgraded	<ul style="list-style-type: none"> • Rethink • Refurbish • Redesign 	<ul style="list-style-type: none"> • Lamello • Cabineo libraries • Palette CAD • SolidWorks + SWOOD 	<ul style="list-style-type: none"> • Faster assembly • Easier repair and refurbishment • Extended product lifespan 	Design joints and connectors digitally before committing to hardware

CHECKLIST

- | | |
|--|--|
| <input type="checkbox"/> Design furniture for tool-less or simplified disassembly | <input type="checkbox"/> Use connector libraries and modular joint systems |
| <input type="checkbox"/> Enable replacement of individual components | <input type="checkbox"/> Support refurbishment and upgrade services |
| <input type="checkbox"/> Reduce assembly time and errors through digital workflows | <input type="checkbox"/> Train designers and technicians in modular design logic |

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7.1.4. Lifecycle assessment & decision support software

Purpose	Supports circular actions	Typical tools	Key benefits	BUSINESS TIP
Quantify environmental impact and guide sustainable choices	<ul style="list-style-type: none"> Optimize Reduce Rethink 	<ul style="list-style-type: none"> SimaPro GaBi OpenLCA One Click LCA ERP systems 	<ul style="list-style-type: none"> Data-driven eco-design Carbon footprint visibility Smarter material selection 	Use LCA tools selectively - focus on key products and materials first

CHECKLIST

- | | |
|---|--|
| <input type="checkbox"/> Measure environmental impacts of materials and processes | <input type="checkbox"/> Compare design alternatives using LCA tools |
| <input type="checkbox"/> Track carbon footprint and resource use | <input type="checkbox"/> Use ERP data to optimize logistics and remanufacturing |
| <input type="checkbox"/> Support eco-design decisions with quantitative data | <input type="checkbox"/> Align reporting with sustainability and climate targets |

7.2. Digital devices and tools supporting circularity of furniture sector

The transition to a circular economy in the furniture industry is increasingly supported by the integration of specialized devices across production and post-use phases. Technologies such as 3D printers, IoT-enabled smart sensors, wood scanning and sorting systems, and ERP-integrated monitoring tools provide manufacturers with enhanced control over material efficiency, product lifecycle management, and waste reduction. These devices enable precision in design, real-time data collection, and automated decision-making, all of which contribute to more sustainable, traceable, and regenerative production models. By embedding intelligence and adaptability into manufacturing processes, the industry can move beyond linear consumption toward resilient circular systems. Throughout the mapping process performed by FULAR partnership, following digital devices&tools (technologies) have been identified: Additive manufacturing (3D printers), IoT and smart sensors, Wood scanning and sorting systems and ERP-integrated monitoring systems.

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7.2.1. Additive Manufacturing (3D Printing)

Purpose	Supports circular actions	Typical devices	Key benefits	BUSINESS TIP
Enable low-waste, customizable, and repair-friendly furniture production	<ul style="list-style-type: none"> • Redesign • Reduce • Repair • Refurbish • Rethink 	<ul style="list-style-type: none"> • BigRep Studio G2 • 3D Systems Pellet Extrusion • CEAD + Polymaker • RapidTech 3D 	<ul style="list-style-type: none"> • Minimal waste • Use of recycled plastics and bio-materials • On-demand production reduces inventory • Easy production of replacement parts 	Start with printing spare parts and connectors - fast ROI and immediate circular impact

CHECKLIST

- | | |
|---|---|
| <input type="checkbox"/> Use 3D printers that support recycled or bio-based materials | <input type="checkbox"/> Apply additive manufacturing for custom parts, repairs, and replacements |
| <input type="checkbox"/> Use large-format printers for furniture components | <input type="checkbox"/> Reduce waste through precise, layer-by-layer production |
| <input type="checkbox"/> Implement on-demand printing to avoid overproduction | <input type="checkbox"/> Test mechanical properties of printed parts before scaling |

7.2.2. IoT and Smart Sensors

Purpose	Supports circular actions	Typical devices	Key benefits	BUSINESS TIP
Transform furniture into data-enabled systems that support repair, maintenance, and lifecycle transparency	<ul style="list-style-type: none"> • Reuse • Repair • Rethink • Optimize 	<ul style="list-style-type: none"> • Arduino Nano • BLE sensors • RFID tags • Kontakt.io • Libelium 	<ul style="list-style-type: none"> • Predictive maintenance extends product life • Real-time usage data supports refurbishment • Inventory and space optimization • Enhanced customer experience 	Begin with simple RFID or BLE tags - low cost, high value for tracking and maintenance

CHECKLIST

- | | |
|---|--|
| <input type="checkbox"/> Embed sensors to monitor wear, usage, and environmental conditions | <input type="checkbox"/> Use IoT platforms for inventory tracking and space optimization |
| <input type="checkbox"/> Apply predictive maintenance to extend product lifespan | <input type="checkbox"/> Track circular metrics (reuse, repair, energy use) in real time |
| <input type="checkbox"/> Integrate sensors with ERP or DPP Systems | <input type="checkbox"/> Ensure data privacy and secure connectivity |

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7.2.3. Wood Scanning and Sorting Systems

Purpose	Supports circular actions	Typical devices	Key benefits	BUSINESS TIP
Improve the quality and yield of reclaimed wood for circular production	<ul style="list-style-type: none"> • Recycle • Reuse • Rethink 	<ul style="list-style-type: none"> • Smarti Lumber Scanners • Fantoni Recy Plant 	<ul style="list-style-type: none"> • Accurate defect detection • Higher yield from reclaimed wood • Clean separation of engineered vs. solid wood • Industrial-scale processing of secondary materials 	Scanning systems unlock the true value of reclaimed wood - essential for scaling circular MDF/chipboard

CHECKLIST

- | | |
|--|--|
| <input type="checkbox"/> Use AI-based scanners to detect defects and classify wood | <input type="checkbox"/> Separate reclaimed wood into usable fractions |
| <input type="checkbox"/> Remove impurities to improve recycled material quality | <input type="checkbox"/> Use automated grading to increase yield |
| <input type="checkbox"/> Integrate scanning with remanufacturing workflows | <input type="checkbox"/> Document material quality for traceability |

7.2.4. ERP-Integrated Monitoring Systems

Purpose	Supports circular actions	Typical systems	Key benefits	BUSINESS TIP
Embed circularity into daily operations through integrated data management	<ul style="list-style-type: none"> • Optimize • Rethink • Reuse • Repair • Recycle 	<ul style="list-style-type: none"> • SoftOne Series 5 Cloud ERP • Monitor G5 ERP 	<ul style="list-style-type: none"> • Real-time material flow tracking • Reduced inventory waste • Better supply chain coordination • Support for DPPs and take-back schemes 	ERP is the backbone of circular operations - start with modules that track materials and waste

CHECKLIST

- | | |
|--|---|
| <input type="checkbox"/> Track material flows across procurement, production, and post-use | <input type="checkbox"/> Use ERP modules for remanufacturing and take-back coordination |
|--|---|

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- Integrate Digital Product Passports (DPP)
- Monitor sustainability metrics (waste, energy, carbon)
- Improve supplier reliability through ERP Analytics
- Use ERP data to optimize circular logistics

7.3. Specialized platforms supporting circularity of furniture sector

Specialized digital platforms are central to advancing circularity in the furniture industry. These platforms facilitate data exchange, lifecycle transparency, and stakeholder coordination across design, production, and post-use phases. By hosting tools such as Digital Product Passports, circularity dashboards, and material traceability modules, they enable manufacturers to document sustainability metrics, verify compliance, and support repair, reuse, and recycling strategies. Interoperable and scalable, these platforms foster cross-sector collaboration and help align business models with emerging circular economy standards and legislation. Throughout the mapping process related to digital platforms fostering circularity in furniture sector, following type of platform have been identified: Product Traceability & Lifecycle Transparency; Reuse & Second-Life Channels; and Industrial Symbiosis & Resource Matching.

7.3.1. Product Traceability & Lifecycle Transparency

Purpose	Enable full visibility of materials, processes, and environmental impacts across the entire lifecycle of furniture products
Supports circular actions	<ul style="list-style-type: none"> • Rethink • Reuse • Recycle • Repair • Refurbish • Remanufacture • Repurpose
Key benefits	<ul style="list-style-type: none"> • Compliance with upcoming EU DPP requirements (mandatory by 2030) • Transparent sourcing and lifecycle documentation • Easier reuse, repair, and recycling • Stronger consumer trust and brand credibility • Foundation for product-as-a-service and circular business models
Typical platforms	<ul style="list-style-type: none"> • Empower Digital Product Passport – QR-linked passports, blockchain backend • DPP ID – Digital Passport – Lifecycle data, repairability scores, origin verification • Digital Twin Platform (DOME) – 360° visualization, customization, order tracking

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Strategic impact	<ul style="list-style-type: none"> • Supports EU Ecodesign compliance • Enables take-back schemes • Reduces production errors • Enhances customer engagement • Strengthens competitive differentiation
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CHECKLIST

<input type="checkbox"/> Implement Digital Product Passports (DPPs) for key product lines	<input type="checkbox"/> Capture data on sourcing, materials, design, and end-of-life pathways
<input type="checkbox"/> Use QR codes or NFC tags for product identification	<input type="checkbox"/> Integrate lifecycle data into ERP or PLM systems
<input type="checkbox"/> Track repairability, recyclability, and material origins	<input type="checkbox"/> Prepare for EU DPP compliance by 2030
<input type="checkbox"/> Use digital twins to reduce errors and support modularity	<input type="checkbox"/> Enable take-back, reuse, and recycling through transparent data

7.3.2. Reuse & Second-Life Channels

Purpose	Extend product lifespans through resale, refurbishment, redistribution, and repurposing
Supports circular actions	<ul style="list-style-type: none"> • Reuse • Refurbish • Repurpose • Recycling (in some models)
Key benefits	<ul style="list-style-type: none"> • Diverts furniture from landfill • Reduces demand for virgin materials • Creates affordable, sustainable options for consumers • Supports community-level circularity • Enables new business models (buy-back, resale, refurbishment services)
Typical platforms	<ul style="list-style-type: none"> • Network of Reuse Centres (Slovenia) – Drop-off, repair, resale • IKEA Buy-Back Estimator – Online valuation, in-store resale • Nonsibuttavianiente (Italy) – Cross-sector reuse of museum exhibits • PERMA Platform – Lifecycle stakeholder coordination, industrial symbiosis
Strategic impact	<ul style="list-style-type: none"> • Supports social inclusion • Extends product life • Strengthens brand circularity • Promotes knowledge exchange • Activates circular loops at consumer and community levels

CHECKLIST

<input type="checkbox"/> Establish or join reuse and second-life channels	<input type="checkbox"/> Offer buy-back, trade-in, or refurbishment programs
<input type="checkbox"/> Provide valuation tools for used furniture	<input type="checkbox"/> Partner with reuse centres or social enterprises
<input type="checkbox"/> Enable resale through digital platforms	<input type="checkbox"/> Design products for easy refurbishment and resale
<input type="checkbox"/> Track second-life flows for circular reporting	<input type="checkbox"/> Promote affordable, sustainable options to consumers

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7.3.3. Industrial Symbiosis & Resource Matching

Purpose	Connect manufacturers, recyclers, and processors to exchange by-products, surplus materials, and underused resources
Supports circular actions	<ul style="list-style-type: none"> • Recycle • Upcycle • Repurpose • Reduce
Key benefits	<ul style="list-style-type: none"> • Turns waste into valuable secondary raw materials • Reduces disposal costs and environmental impact • Supports regional circular ecosystems • Enables cross-sector collaboration • Optimizes logistics and resource use
Typical platforms	<ul style="list-style-type: none"> • Digital Platform for Circular Economy (Serbia) – Interactive map, by-product listings, alerts • Cloudwood – Blockchain traceability for timber supply chains
Strategic impact	<ul style="list-style-type: none"> • Diverts waste from landfill • Feeds reclaimed materials into new production • Promotes sustainable sourcing • Strengthens local bioeconomy • Supports EU circular economy goals

CHECKLIST

- | | |
|--|--|
| <input type="checkbox"/> Register surplus materials and by-products on symbiosis platforms | <input type="checkbox"/> Source reclaimed wood, textiles, and plastics from partner industries |
| <input type="checkbox"/> Use digital matchmaking tools to identify resource exchanges | <input type="checkbox"/> Collaborate with recyclers and processors for material recovery |
| <input type="checkbox"/> Track material flows for circular reporting | <input type="checkbox"/> Share logistics infrastructure to reduce emissions |
| <input type="checkbox"/> Use blockchain-based tools for traceability where relevant | <input type="checkbox"/> Integrate symbiosis opportunities into procurement strategies |

8. Advanced concepts fostering circularity of furniture sector

The transition to circular practices in the furniture industry is being accelerated by innovative marketing strategies that emphasize sustainability, transparency, and user engagement. Through the mapping exercise performed by FULAR consortium, range of innovative marketing concepts and approaches has been identified. As expected, actual business models which are based on circular economy marketing concepts are still far from becoming dominant or having significant share in the furniture industry. However, their relevance in global terms increases constantly, as the consumers are becoming more aware of the environmental issues and the need to neutralize negative impact of the society.

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Identified key concepts include service-based models like Furniture-as-a-Service, which replace ownership with flexible access, and Design for Disassembly, which enables easy repair and recycling through modular construction.

Refurbishment Networks and Recommerce Platforms foster reuse and local economic development by restoring and reselling furniture through digital and community channels. Digital Lifecycle Tools enhance product transparency and customer loyalty by tracking usage and material origins, while Eco-Materials Promotion highlights sustainable sourcing and certified components to differentiate brands.

Take-Back and Modular Programs extend product life and encourage customer retention through upgrade kits and buy-back schemes. Finally, Local Circular Craftsmanship celebrates regional identity and sustainability by promoting handmade furniture from reclaimed or natural materials, reinforcing cultural and environmental values.

Together, these concepts form a robust framework for circular innovation - blending design, technology, and storytelling to reshape how furniture is produced, marketed, and consumed.

Results of the mapping process are presented below (one table per identified concept).

8.1. Furniture-as-a-Service

Table 7: Description of Furniture-as-a-Service concept

Concept	Circular Actions	Marketing Strategy	Key Enablers	Case Examples
Furniture-as-a-Service	Reuse, Refurbish	Subscription models, ESG branding, flexible ownership	Web platforms, logistics systems	Enky, IKEA Preowned
<p>Furniture-as-a-Service represents a shift from traditional ownership models to service-based access. Instead of purchasing furniture outright, customers subscribe to usage plans that include delivery, maintenance, and eventual replacement or recovery. This approach encourages longer product lifecycles and supports circular principles by keeping materials in circulation and reducing waste. It's particularly effective in dynamic environments like offices, co-working spaces, and hospitality sectors where flexibility and sustainability are increasingly valued.</p>				
<p>Furniture-as-a-Service - Case study Enky is a European platform offering flexible furniture solutions for hospitality, living, and workspaces. Through subscription, circular purchase, and leaseback models, Enky enables users to access high-quality, sustainable furniture without the burden of ownership.</p>				

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Its Furniture-as-a-Service approach keeps products in circulation longer, supports reuse and resale, and reduces waste. Customers can subscribe monthly, buy second-hand, or sell back furniture when needs change. Enky also buys existing furniture and leases it back, unlocking capital while maintaining usability.

With design-led, eco-conscious collections and digital lifecycle support, Enky exemplifies how circular economy principles can be embedded in everyday furnishing. The model is highly replicable for regional initiatives - especially in co-working hubs, Living Labs, and serviced apartments - where adaptability and sustainability are key. More info available on www.enky.com

8.2. Design for Disassembly

Table 8: Description of Design for Disassembly concept

Concept	Circular Actions	Marketing Strategy	Key Enablers	Case Examples
Design for Disassembly	Redesign, Remanufacture	Eco-design storytelling, modularity campaigns	CAD tools, modular construction kits	Wehlers, Herman Miller
<p>Design for Disassembly focuses on creating furniture that can be easily taken apart and reassembled. This design philosophy enables straightforward repair, upgrading, and recycling of individual components. By simplifying the disassembly process, manufacturers can reduce the environmental impact of their products and extend their usability. It also opens the door for modular marketing strategies, where adaptability and personalization become key selling points.</p>				
<p>Design for Disassembly - Case study Herman Miller is a global furniture brand recognized for embedding sustainability into every aspect of its operations. From pioneering Design for Environment (DfE) principles to achieving Cradle to Cradle certifications, the company has consistently led the way in circular innovation.</p> <p>Its initiatives include the use of ocean-bound plastics in iconic products like the Aeron and Sayl chairs, a rePurpose program that diverts up to 98% of used furniture from landfills, and a commitment to 100% renewable electricity across global facilities. Herman Miller also promotes material transparency through tools like the European Declare Label, helping customers understand product origins and end-of-life pathways.</p> <p>As a founding member of the US Green Building Council and NextWave Plastics, Herman Miller exemplifies how large-scale operations can drive systemic change. Its model offers replicable strategies for regional ecosystems - combining eco-design, lifecycle engagement, and responsible sourcing to create a better world through better furniture.</p> <p>More info available on https://www.hermanmiller.com/en_eur/better-world/sustainability/</p>				

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8.3. Refurbishment Networks

Table 9: Description of Refurbishment Networks concept

Concept	Circular Actions	Marketing Strategy	Key Enablers	Case Examples
Refurbishment Networks	Repair, Refurbish	Local craftsmanship promotion, community engagement	Workshops, repair kits, digital guides	Relieve Furniture, Lejlina radionica
<p>Refurbishment Networks involve coordinated efforts among local artisans, workshops, and SMEs to restore used furniture to a functional or aesthetic standard. These networks support circular goals by breathing new life into discarded items, reducing the need for new production, and preserving craftsmanship. They also foster community engagement and can be promoted through storytelling that highlights heritage, skill, and sustainability.</p>				
<p>Refurbishment Networks – Case study</p> <p>Relieve Furniture is a Belgium-based platform transforming office furnishing through circular practices. It offers reused furniture, zero-waste removals, and redistribution programs that extend product lifecycles while supporting social impact. Their model combines space planning, flexible furnishing, and digital catalogues to help businesses transition to sustainable workspaces.</p> <p>With over 145,000 items rehoused, 450+ charities and schools supported, and 1 million tons of CO₂ saved, Relieve demonstrates how circularity can be both environmentally and economically effective. Their Solidarity™ program redistributes furniture to underserved communities, while clients benefit from cost savings, reduced emissions, and enhanced ESG performance.</p> <p>Relieve’s approach is highly replicable for regional initiatives - especially in public administration, co-working hubs, and educational institutions - where sustainability, affordability, and social value intersect. More info available on: https://www.relievefurniture.com/</p>				

8.4. Recommerce Platforms

Table 10: Description of Recommerce Platforms concept

Concept	Circular Actions	Marketing Strategy	Key Enablers	Case Examples
Recommerce Platforms	Reuse, Repair	End-to-end B2B logistics, resale marketing	E-commerce backend, cleaning & repair systems	Mjuk.com, Sajkla
<p>Recommerce Platforms are digital marketplaces that facilitate the buying and selling of second-hand or refurbished furniture. These platforms often integrate logistics, cleaning, and repair services to ensure quality and convenience. By enabling reuse and resale, recommerce reduces landfill contributions and makes sustainable furniture more accessible to a broader audience. It’s a scalable model that can serve both individual consumers and businesses.</p>				

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Recommerce Platforms – Case study

Mjuk is a leading Nordic recommerce platform that simplifies the resale of second-hand furniture for both individuals and businesses. Specializing in overstock, returns, and showroom pieces, Mjuk handles the entire process - from quality control and storage to marketing, delivery, and payment - offering a seamless circular solution.

By transforming excess inventory into new revenue streams, Mjuk helps partners reduce waste, cut costs, and meet sustainability goals without major infrastructure investments. Its model supports reuse, redistribution, and lifecycle extension, making it a scalable tool for circular transition in the furniture sector.

With success stories from brands like Sofacompany, Layered, and Trademax, Mjuk demonstrates how digital platforms can turn problematic products into profitable, sustainable outcomes. The approach is highly replicable for regional initiatives, especially in public procurement, retail, and co-working environments. More info available on: www.mjuk.com

8.5. Digital Lifecycle Tools

Table 11: Description of concept based on Digital Lifecycle Tools

Concept	Circular Actions	Marketing Strategy	Key Enablers	Case Examples
Digital Lifecycle Tools	Reuse, Remanufacture	QR/NFC-enabled storytelling, traceability marketing	Digital twins, mobile apps	Steelcase, IKEA Circular Hub
<p>Digital Lifecycle Tools use technologies like QR codes, NFC tags, and digital twins to track the history, usage, and material composition of furniture items. These tools enhance transparency and allow users to engage with products throughout their lifecycle - from purchase to maintenance to end-of-life decisions. They also support predictive maintenance and data-driven circular strategies, strengthening brand trust and customer loyalty.</p>				
<p>Digital Lifecycle Tools – Case study</p> <p>IKEA Circular Hub is a global initiative designed to extend the life of furniture through resale, repair, and reuse. Originally launched as “Bargain Corner,” the program now offers ex-display items, discontinued products, and gently used furniture a second chance - diverting them from landfill and into new homes.</p> <p>Customers can resell their used IKEA furniture back to the company, contributing to a dynamic inventory of circular goods. IKEA also supports repairs through its spare parts program, enabling owners to maintain and restore items rather than discard them. To ease logistics, IKEA partners with Hertz 24/7, offering hourly van rentals for transporting larger pieces.</p> <p>The Circular Hub exemplifies how large-scale retail can embed circularity into everyday consumer behavior - making sustainability accessible, affordable, and practical. It’s a replicable model for regional initiatives, especially in retail, public procurement, and educational outreach.</p>				

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8.6. Eco-materials promotion

Table 12: Concept based on promotion of Eco-materials

Concept	Circular Actions	Marketing Strategy	Key Enablers	Case Examples
Eco-Materials Promotion	Recycle, Upcycle	Material transparency, certification-based branding	Bio-based adhesives, reclaimed wood, recycled textiles	ECOR, Seaqual, MOGU
<p>Eco-Materials Promotion centres on highlighting the use of sustainable, recycled, or bio-based materials in furniture production. This concept leverages certifications and transparency to differentiate products in the marketplace. By showcasing the environmental benefits of material choices, companies can appeal to conscious consumers and align their branding with broader sustainability goals.</p>				
<p>Eco-Materials Promotion – Case study MOGU is an Italian design and materials company pioneering the use of mycelium - the root structure of fungi - to create fully circular interior products. Their collections include acoustic panels, wall coverings, and resilient flooring, all made from upcycled textile residues and agro-industrial waste. MOGU’s acoustic panels are the first commercially available products of their kind, combining high sound absorption with radically sustainable aesthetics. Their flooring solutions replace traditional pigments with bio-based inputs like rice straw, coffee grounds, and seaweed, offering durability with a soft, natural touch. Through iterative R&D and cross-industry collaboration, MOGU transforms low-value biomass into high-performance design materials. Their model exemplifies regenerative production and is highly replicable for regional initiatives focused on sustainable architecture, circular design labs, and eco-material innovation. More info available on: https://mogu.bio/</p>				

8.7. Take-Back & Modular Programs

Table 13: Concept based on Take-Back & Modular Program

Concept	Circular Actions	Marketing Strategy	Key Enablers	Case Examples
Take-Back & Modular Programs	Recycle, Refurbish	Buy-back guarantees, modular upgrade kits	CNC machines, pellet presses, disassembly tools	Casala, Vepa-Plastic Whale
<p>Take-Back and Modular Programs offer customers the opportunity to return used furniture or upgrade existing pieces through modular components. These programs encourage recycling and remanufacturing while building long-term relationships with customers. They can be tied to loyalty schemes or ESG reporting, reinforcing a company’s commitment to circular practices and customer satisfaction.</p>				
<p>Take-Back and Modular Programs – Case study</p>				



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Casala is a Dutch furniture manufacturer specializing in stylish, functional contract furniture for offices, education, hospitality, and public spaces. With over a century of experience, Casala integrates circularity into its design DNA - combining modularity, recycled materials, and lifecycle responsibility.

Their award-winning Omega seating range, for example, features a slim felt shell made from recycled PET and a lightweight steel frame, showcasing how high design can meet low environmental impact. Casala also promotes modular systems like Riva, enabling flexible layouts and easy reconfiguration for dynamic workspaces.

Through initiatives like Circular Refurniture, Casala refurbishes and redistributes used furniture, extending product life and reducing waste. Their approach is highly replicable for regional innovation hubs, co-working spaces, and public procurement - where durability, adaptability, and sustainability are key. More information available on: <https://www.casala.com/>

8.8. Local Circular Craftsmanship

Table 14: Local Circular Craftsmanship concept

Concept	Circular Actions	Marketing Strategy	Key Enablers	Case Examples
Local Circular Craftsmanship	Reuse, Repurpose	Heritage branding, artisanal storytelling	Manual tools, natural oils, reclaimed materials	Flame Furniture, Hardstuff.eu
<p>Local Circular Craftsmanship celebrates regionally sourced, handcrafted furniture made from reclaimed or natural materials. This concept supports cultural preservation, reduces transportation emissions, and strengthens community resilience. It's particularly effective in storytelling campaigns that emphasize authenticity, tradition, and environmental responsibility.</p>				
<p>Local Circular Craftsmanship – Case study</p> <p>Hardstuff is a Slovenia–Serbia-based furniture brand that blends industrial aesthetics with handcrafted sustainability. Specializing in dining tables, stools, and coffee tables, Hardstuff uses raw materials like reclaimed wood, steel, glass, and concrete to create durable, timeless pieces. Each item is handcrafted, emphasizing longevity, repairability, and emotional value. With over a decade of experience, Hardstuff promotes local production, minimal waste, and material authenticity. Their approach supports circular principles by prioritizing reuse, artisanal restoration, and modular design. The brand's identity - "Handcrafted with love" - underscores its commitment to quality and sustainability.</p> <p>Hardstuff's model is highly replicable for regional initiatives focused on circular design labs, co-working spaces, and heritage-based innovation. It offers a compelling narrative for promoting local craftsmanship, reducing material throughput, and elevating sustainable aesthetics. More information available on: https://hardstuff.eu/</p>				

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SME SHORTCUT: HOW TO START

Choose one concept that matches your customers (e.g., repair/refurbishment services, take-back with a retailer or a recommerce partner). Pilot it on one product line, define responsibilities and KPIs (returned units, repaired/refurbished units, resale value) and scale only if the pilot works

9. Market Perspectives: Consumers and SMEs

A survey among consumers and SMEs within the FULAR project explored purchasing preferences, awareness of circular economy practices, and barriers to implementation in the furniture sector. The findings summarise what consumers value when buying furniture and what SMEs are already doing – plus the key gaps that still limit wider uptake of circular solutions.

9.1. Consumer Attitudes and Preferences

Understanding consumer behaviour is essential for accelerating the transition toward a circular furniture sector, as purchasing decisions directly influence production models, material choices, and product lifespans. The survey findings provide valuable insight into consumer expectations regarding quality, durability, design, and sustainability, while also highlighting the conditions under which circular products and services are more likely to be accepted in the market.

The results helped identify the key factors influencing furniture purchasing decisions, including the growing relevance of sustainability:

- Consumers most often preferred solid oak, followed by engineered wood (MDF), upholstery fabric, and other solid wood species;
- Preferred colours were medium wood tones (e.g., oak/teak), then lighter tones (maple/ash), and darker tones (walnut/mahogany);
- Preferred tactile qualities were smooth textures, followed by fine and rustic finishes;
- Matte finishes were most preferred; oil and high-gloss finishes also received notable support. Custom-made and mass-produced furniture were both widely accepted.

Survey responses reveal a consistent preference for furniture that is durable, aesthetically appealing, and perceived as good value for money. Durability and quality ranked among the primary decision-making criteria, alongside design. While

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sustainability is increasingly important to a significant share of respondents, price remains a decisive factor.

Open-ended responses further highlighted that consumers expect sustainable options to remain competitively priced. When higher prices are unavoidable, consumers expect clear added value - such as longer product lifespan, repairability, or healthier materials.

Several respondents emphasized the need for simple and trustworthy information at the point of sale to distinguish genuinely sustainable products from misleading claims. Suggested tools included clear labels, concise product factsheets, and transparent communication regarding health and safety aspects, particularly when recycled materials are used.

When furniture is no longer needed, many consumers donate, sell or relocate usable items. Others dismantle and discard furniture, while a smaller share use wood parts for heating. This suggests reuse is common when convenient options exist, but disposal increases when alternatives are lacking

Interest in circular services - including repair, refurbished products, take-back schemes, and rental or subscription models - was evident but typically conditional on affordability and convenience. Overall, consumers are not resistant to circular solutions; rather, they require options that are accessible, understandable, and fairly priced.

9.2. SME Awareness and Practices

SMEs reported several circular practices already in use:

- Reducing waste through better cutting plans, CNC and nesting software;
- Reusing offcuts internally and selling residues to recyclers (and sometimes energy recovery);
- Testing or using recycled inputs (reclaimed wood, recycled panels, fabrics and foams);
- Improving product longevity through modular design, replaceable components and design for disassembly.

Despite these positive developments, SMEs identified several structural barriers.

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Key barriers reported by SMEs include:

- Customer specifications that limit alternative materials (especially in custom production);
- Inconsistent quality and supply of secondary materials;
- Regulatory uncertainty and additional time/cost to adapt processes;
- Lack of local infrastructure for collection, sorting and recycling.

SMEs expressed a strong need for practical guidance, replicable examples, and clearer access to funding opportunities, including grants and tenders that could support initial investments in circular technologies, equipment, and services

9.3. Gaps and Opportunities

When analyzing supply and demand together, the findings reveal both a meaningful overlap and several structural gaps.

9.3.1. Areas of alignment

Both consumers and SMEs value long-lasting, high-quality furniture designed for extended use:

Consumers prefer products that are durable and repairable.

Many SMEs are already incorporating repairability and component replacement into product design.

9.3.2. Key gaps

Information	Consumers seek simple, credible sustainability information at the point of sale. SMEs require standardized tools and verification pathways to communicate such claims effectively.
Affordability	Consumers are price-sensitive. SMEs face higher costs and operational risks when sourcing certified or recycled materials, particularly in unstable supply markets.
Logistics and service models	Consumers show willingness to engage with take-back, repair, and refurbished options. SMEs need local partners, infrastructure, and operational frameworks to implement these services at scale.

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9.3.3. Strategic Implications

The findings point toward several practical priorities:

- Position “long life and easy repair” at the core of both consumer messaging and product development strategies;
- Simplify sustainability communication through short product factsheets, clear labels, and transparent health and safety information;
- Reduce end-of-life friction by supporting local take-back, repair, and refurbishment systems with clear intake and grading procedures;
- Lower adoption risks for SMEs by facilitating connections with reliable suppliers of recycled materials and mapping relevant funding opportunities;
- Promote targeted education through micro-trainings on design for disassembly and material optimization, complemented by concise consumer guidance accessible via QR codes.

The results suggest that demand for longer-lasting furniture is emerging, while SMEs already have a baseline of technical capacity to adopt circular business models. The main missing elements are practical frameworks, reliable secondary-material supply and local end-of-life services.

10. Communication with customers in the circular economy

Effective communication with customers is a key element in the successful implementation of circular business models. Technical improvements, certifications and environmental benefits only have value when the customer understands, recognizes and accepts them as part of their purchasing decision. Companies therefore need a clear approach to how to present the circular properties of products and services and how to build trust in the market.

10.1. The role of communication

Communication allows the company to present to customers the benefits that the circular model brings: longer product lifespan, repairability, less waste, lower usage costs and better traceability of materials. Since circular models are often less well-known, the company's task is to explain to customers why such products are different and how they can benefit them in practice.

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10.2. Key principles of effective communication

- **Clarity:** use simple language and avoid technical jargon
- **Transparency:** claims must be based on verifiable data, certificates or environmental declarations
- **Relevance:** highlight benefits customers care about (durability, repairs, warranties, savings)
- **Accessibility of information:** make information easy to find at the point of purchase, on the product and through digital channels.

10.3. Content that makes sense to communicate to customers

- Durability of materials and percentage of recycled content
- Possibility of repair, upgrade or replacement of parts instructions for proper use and maintenance
- Materials origin of and certificates (FSC, PEFC, EPD)
- Return, repair and refurbishment services
- Digital product passport information that helps customers make informed decisions

10.4. Avoiding misleading environmental claims

The upcoming regulation on environmental claims makes it important for companies to use verifiable and demonstrable claims. Generic labels such as “eco”, “green” or “sustainable” without supporting evidence are not allowed. The company must clearly state what the claim is based on (e.g. certification, EPD, recycled content).

Examples of safe, specific claims (better than “green”)

- *“FSC-certified wood” / “PEFC-certified wood”*
- *“Low-emission board (E1)” (if documented)*
- *“Spare parts available for X years”*
- *“Repair service available” / “Replaceable upholstery covers”*
- *“X% recycled content” (with evidence)*

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10.5. Recommended communication channels

- Product labelling with clear information
- QR codes that lead to additional information or a digital passport
- Websites with more detailed technical information
- Short maintenance and repair instructions
- Presentation materials at points of sale

The combination of physical and digital channels allows the customer to receive information at the moment they need it.

10.6. The Importance of Customer Feedback

Circular models often involve repairs, returns, or product reuse. Customer feedback is therefore an important source of improvement. By regularly collecting feedback, companies can improve the user experience, customize products, and strengthen their offerings.

11. Barriers to Circular Implementation

Circular implementation in the furniture sector is slowed by several structural, market and operational barriers that affect the whole value chain – especially SMEs.

- a) Infrastructure and logistics**
 - Limited collection, sorting and reverse logistics for end-of-life furniture;
 - Take-back systems are underdeveloped; many products end up in landfill or energy recovery;
 -
- b) Secondary material markets**
 - Unstable supply, uncertain demand and price volatility reduce investment confidence;
 - Quality variability of recycled inputs can affect durability, functionality and aesthetics;
- c) Knowledge and skills**
 - Limited practical know-how on eco-design, circular processes and resource optimization;
 - Weak collaboration with research/technology providers slows adoption;
- d) Demand-side barriers**

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- Awareness and acceptance of refurbished/second-hand furniture varies;
 - Price often dominates decisions; limited spare parts and repair services encourage replacement;
- e) Product design barriers**
- Mixed materials, complex construction and non-modular components make disassembly and repair difficult;
- f) Financial barriers**
- Upfront costs for new technologies, process changes and refurbishment are high for SMEs;
 - Without incentives or support, circular investments are perceived as risky;
- g) Regulatory and policy barriers**
- Regulatory uncertainty and administrative burden slow implementation;
 - EPR schemes are uneven, and practice is not always aligned with the waste hierarchy;
- h) Value chain fragmentation**
- Limited coordination among manufacturers, designers, suppliers, recyclers and public actors reduces feasibility and scale.

12. Opportunities and Benefits for the Furniture Sector

Despite the existing barriers, the transition toward a circular economy presents significant opportunities for the furniture sector. Circular approaches can enhance competitiveness, reduce environmental impacts, and strengthen long-term resilience across value chains.

a) Resource Efficiency and Cost Optimization

Improved material efficiency, better cutting strategies, and the reuse of production residues can significantly reduce waste generation and raw material costs. Over time, circular practices contribute to more stable resource management and improved operational efficiency;

b) Innovation and New Business Models

Circularity encourages the development of innovative business models such as leasing, product-as-a-service, refurbishment, and take-back schemes. These models extend product lifespans while generating new revenue streams and strengthening customer relationships;

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c) Market Differentiation and Competitive Advantage

Companies that integrate sustainability into their core strategies can differentiate themselves in increasingly environmentally conscious markets. Transparent communication, eco-labels, and certified materials help build trust and strengthen brand reputation;

d) Environmental Benefits

Circular production reduces pressure on natural resources, lowers greenhouse gas emissions, and supports waste prevention. By keeping materials in use longer, the sector contributes directly to climate and environmental objectives;

e) Strengthened Value Chain Collaboration

Closer cooperation among manufacturers, recyclers, suppliers, designers, and public actors can foster industrial symbiosis and improve material circulation. Such collaboration enhances systemic efficiency and supports regional circular ecosystems;

f) Consumer Value and Extended Product Lifetimes

Durable, repairable, and upgradeable furniture provides long-term value for consumers while reducing total lifecycle costs. Access to repair and refurbishment services further supports responsible consumption patterns;

g) Access to Funding and Policy Support

The growing policy focus on circular economy transitions creates opportunities for companies to access grants, innovation funds, and green financing instruments. Public support can significantly lower investment risks and accelerate implementation.

13. Practical Guidelines for Implementation

The transition toward circular business models requires a structured and strategic approach. While the specific pathway may vary depending on company size, market position, and production capacity, several core steps can guide furniture manufacturers in integrating circular principles into their operations. The following roadmap provides a practical framework designed particularly for micro, small and medium-sized enterprises (MSMEs), supporting a gradual yet effective transition toward circular production systems.¹⁴

¹⁴ [Online] Available at: <https://www.teimas.com/en/blog/applied-circular-economy-from-strategy-to-action-in-large-companies>

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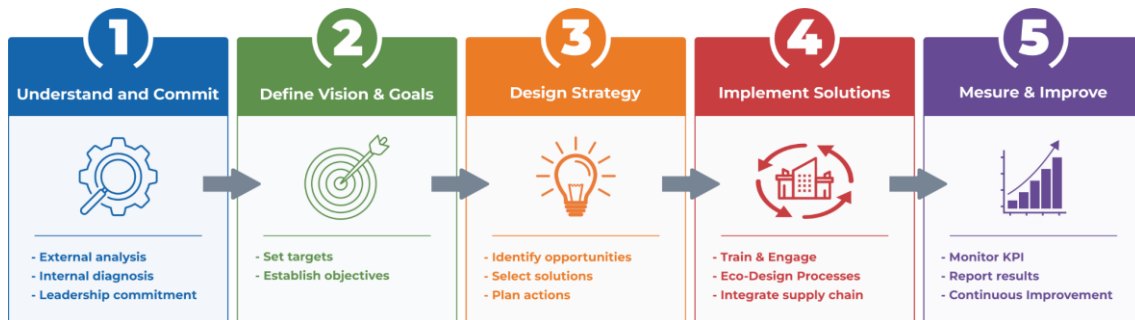


Figure 6: Step by Step Roadmap to a Circular Economy

Step 1 – Understand the context and build commitment

Review external drivers (regulation, customer expectations, competitors) and assess your current situation (materials, energy, waste, key products and processes). Assign a responsible person and secure management commitment for a first pilot.

Step 2 – Define a circular vision and objectives

Set 2–4 clear targets (e.g., reduce waste, increase recycled/certified materials, improve repairability, introduce a take-back option) and link them to business priorities (cost, quality, lead time, customer value).

Step 3 – Design the circular strategy

Select actions across design, materials, production and services. Prioritise what is feasible now and define a simple action plan (who / when / cost / expected benefit).

Step 4 – Implement circular solutions

Start with one product line. Improve cutting/nesting, keep waste streams clean, redesign key parts to be replaceable, and agree requirements with suppliers. If relevant, set up a basic repair/take-back workflow with one partner.

Step 5 – Measure, communicate and continuously improve

Track a small set of KPIs (e.g., waste rate, recycled/certified share, repaired/refurbished units, cost savings). Communicate only what you can prove. Use results and feedback to improve and expand.

The transition to circular practices is not a single action but a continuous strategic process. By following these steps, companies can progressively integrate circular principles into their operations while strengthening resilience and long-term competitiveness

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13.1. Toolbox for SMEs

The toolbox enables companies to systematically collect data, demonstrate compliance, monitor environmental indicators and effectively prepare for green public procurement requirements. It is a collection of practical tools that help companies in their daily work and in preparing bids.

Key elements of the toolbox

- Compliance evidence: folder structure and templates for EPDs, certificates (ISO 14001/EMAS, FSC/PEFC), supplier declarations and technical sheets;
- Internal tracking templates: simple forms for materials, energy, waste and other key indicators;
- Checklists: short checklists for GPP requirements and “what documents are missing”;
- Readiness assessment: short self-check questionnaire / matrix to identify gaps;
- Communication templates: short product factsheets and “safe claims” examples (avoid greenwashing);
- Evidence register: a list of all certificates, declarations and documents customers may request;
- Bid preparation tools: a checklist and templates for tender documentation and technical responses.

13.2. Action Plan for SMEs – Step-by-Step Implementation Guide

The transition to a circular economy requires SMEs to have a clear, feasible and step-by-step plan. The action plan below provides a practical framework that enables companies to implement circular approaches systematically, with clear responsibilities, timelines and the necessary tools.

Step 1: Assess the Current State (Baseline Assessment)

What to do:

- review of material flows, energy consumption, waste, emissions;
- identification of key products, processes and suppliers;
- assessment of compliance with existing environmental requirements;

Responsibility: Production Manager, Quality Manager, Purchasing Manager

Tools: Environmental Indicator Register; Material Flow Table; Self-Assessment Questionnaire; Supplier Records

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Step 2: Identify Circular Opportunities

What to do:

- identify areas where material consumption can be reduced;
- search for opportunities for reuse, repair or recycling;
- seview opportunities for using certified or recycled materials;

Responsibility: R&D, purchasing, management

Tools: Life cycle analysis (basic); Certified material databases (FSC/PEFC, EPD); Internal waste and consumption data

Step 3: Define Circular Targets and KPIs

What to do:

- set measurable targets (e.g. 10% less waste, 20% recycled materials);
- set monitoring indicators (KPIs);
- set responsible person for monitoring;

Responsibility: management, quality manager, sustainability manager

Tools: Environmental indicators register; Annual reporting template; Internal dashboard or Excel

Step 4: Implement Circular Measures

What to do:

- implement changes in production (optimization, waste reduction);
- switch to certified or recycled materials;
- establish systems for repairs, returns or reuse;
- employee training;

Responsibility: production, purchasing, logistics, HR

Tools: Supplier declarations; Evidence registers; Material data sheets; Internal procedures and instructions

Step 5: Monitor Progress and Report Results

What to do:

- regular collection of data on consumption, waste, materials;
- annual reporting on achieved results;
- adjustment of measures according to results;

Responsibility: Quality Manager, Production Manager

Tools: Environmental indicators register; Annual report; Internal control system

Step 6: Communicate Circular Value to Consumers

What to do:

- prepare clear, verifiable environmental claims;
- include sustainability data in offers;
- use EPDs, certificates and data sheets as evidence;

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- avoid greenwashing;

Responsibility: Marketing, Sales, Sustainability Manager

Tools: Template for describing the sustainability properties of the product; Template for environmental claims; Communication materials (QR codes, data sheets)

Step 7: Preparing for Sustainable and Circular Procurement

What to do:

- establishment of a folder with evidence;
- preparation of standardized supplier declarations;
- verification of compliance with GPP criteria;
- preparation of a checklist for submitting bids;

Responsibility: purchasing, sales, quality manager

Tools: Register of evidence; Checklist for GPP bids; ESPD (European Single Procurement Document) template; Toolbox for SMEs

In conclusion SMEs can successfully implement circular practices if they have a clear, structured and feasible plan. The key is in small but consistent steps: from basic analysis, through the introduction of changes, to regular monitoring and clear communication with customers.

The toolbox, which includes registers, templates, checklists and communication tools, enables SMEs to implement circular approaches efficiently, without unnecessary complexity and with a clear focus on results.

13.3. Tools Supporting the Circular Transition of SMEs

Small and medium-sized enterprises (SMEs) often face structural, financial, and knowledge-related barriers when shifting from a linear to a circular business model. To support this transition, several tools, frameworks, and platforms have been developed at EU and international level. These tools help companies assess their current state, identify opportunities, and implement circular strategies in a structured way.

13.3.1. Circular Readiness Assessment (ready2LOOP)

The Circular Readiness Assessment (ready2LOOP) is a structured diagnostic instrument designed to evaluate an enterprise's preparedness for transitioning from a linear to a circular economic model. It provides a comprehensive, multi-dimensional analysis of organizational capabilities, operational practices, and strategic alignment with circular economy principles. The tool is particularly relevant for SMEs, which often

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lack the internal resources and methodological frameworks required to systematically plan and implement circular transformation.

Purpose and Theoretical Foundation

The assessment is grounded in contemporary circular economy theory, which conceptualizes circularity as a systemic transformation encompassing product design, material flows, business models, and value-chain collaboration. The tool operationalizes these concepts into measurable dimensions, enabling companies to:

- assess their current circular maturity,
- identify structural and operational gaps,
- prioritize interventions with the highest potential impact,
- and establish a strategic foundation for long-term circular transition.

The underlying premise is that circular transformation requires coordinated action across multiple organizational layers, including governance, innovation capacity, supply-chain integration, and digital enablement.

Methodological Structure

The Circular Readiness Assessment employs a multi-criteria evaluation framework consisting of qualitative and quantitative indicators. These indicators are organized into thematic clusters that reflect key stages of the product and business model lifecycle, such as:

- circular product and service design,
- sustainable sourcing and material management,
- resource-efficient production processes,
- logistics and distribution models,
- customer engagement and value retention strategies,
- end-of-life management and reverse logistics,
- data governance and digital support systems,
- organizational culture, leadership, and strategic orientation.

The assessment uses a maturity-level approach, typically ranging from initial to advanced, allowing companies to benchmark their current state and monitor progress over time.

Implementation Process

a) Self-assessment phase - Organizations complete a structured questionnaire that captures the extent to which circular practices, competencies, and enabling conditions are present. The process is designed to be accessible and time-efficient, while still providing a high level of analytical depth.

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b) Analytical synthesis - The tool generates a detailed circularity profile, including visual representations of maturity levels across all assessed dimensions. This synthesis highlights systemic strengths, critical bottlenecks, and interdependencies between different areas of the value chain.

c) Prioritization of strategic actions - Based on the diagnostic results, the tool identifies priority areas for intervention. These may include technological upgrades, redesign of product-service systems, development of new business models, capacity-building initiatives, or enhanced collaboration with supply-chain partners.

d) Access to a curated toolbox - Companies receive access to an extensive repository of methodologies, templates, case studies, and practical tools that support the implementation of recommended actions. This ensures that the assessment is not merely descriptive but also action-oriented.

Strategic Value for Enterprises

The Circular Readiness Assessment provides several high-value outcomes:

- **Evidence-based decision-making:** Companies gain a structured understanding of their circular potential and constraints;
- **Risk reduction:** Early identification of gaps reduces the likelihood of costly or ineffective interventions;
- **Regulatory preparedness:** The tool supports alignment with emerging EU policies, including the Circular Economy Action Plan and sustainable product requirements;
- **Enhanced competitiveness:** Circular strategies often lead to cost savings, improved resource efficiency, and new market opportunities;
- **Innovation acceleration:** The assessment stimulates organizational learning and fosters a culture of continuous improvement.

For SMEs, the tool serves as a practical entry point into circular transformation, offering a clear roadmap without requiring extensive internal expertise.

13.3.2. Circular Transition Roadmaps

A Circular Transition Roadmap is a strategic planning instrument that guides enterprises through the structured transformation from linear to circular business models. It provides a long-term, evidence-based framework that integrates organizational, technological, and value-chain considerations into a coherent transition pathway. Roadmaps are widely used in policy, industry, and research contexts to operationalize circular economy principles and support systemic change.

Purpose and Theoretical Foundation

Circular Transition Roadmaps are grounded in systems thinking and lifecycle-based approaches to sustainability. They recognize that circular transformation requires

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coordinated interventions across multiple levels of the enterprise and its ecosystem, including:

- product and service design,
- material and resource flows,
- business model innovation,
- supply-chain collaboration,
- digitalization and data governance,
- organizational culture and governance structures.

The purpose of a roadmap is to translate these theoretical principles into a strategic, time-bound, and actionable plan. It provides a structured mechanism for aligning internal stakeholders, prioritizing interventions, and sequencing activities in a way that maximizes impact and minimizes transition risks.

Methodological Structure

Circular Transition Roadmaps typically follow a multi-phase analytical and planning methodology, which includes:

a) Baseline assessment - A comprehensive evaluation of the company's current state, including resource efficiency, circular practices, technological capabilities, and organizational readiness;

b) Opportunity identification - Mapping of circular opportunities across the value chain, such as product redesign, waste valorization, service-based models, industrial symbiosis, or digital traceability;

c) Gap analysis - Comparison between the current state and desired circular maturity levels, identifying structural, technological, and organizational barriers;

d) Strategic prioritization - Selection of high-impact interventions based on feasibility, expected benefits, regulatory drivers, and alignment with corporate strategy;

e) Roadmap formulation - Development of a time-bound plan that includes:

- strategic objectives,
- milestones and timelines,
- required resources and competencies,
- KPIs and monitoring mechanisms,
- governance structures for implementation.

The methodological structure ensures that the roadmap is both analytically robust and operationally actionable.

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Implementation Process

a) Strategic alignment and stakeholder engagement - Internal and external stakeholders are involved early to ensure shared ownership and cross-functional commitment.

b) Pilot projects and experimentation - Selected circular initiatives are tested through pilot projects to validate assumptions, reduce uncertainty, and build internal capacity.

c) Scaling and integration - Successful pilots are scaled across the organization and integrated into core business processes, supply-chain relationships, and product portfolios.

d) Monitoring and continuous improvement - KPIs and feedback loops enable ongoing evaluation, learning, and adaptation of the roadmap as technologies, markets, and regulations evolve.

This iterative process ensures that the roadmap remains dynamic and responsive to emerging opportunities and constraints.

Strategic Value for Enterprises

Circular Transition Roadmaps provide significant strategic benefits, including:

- **Long-term clarity and direction:** A structured pathway for transitioning to circular business models;
- **Risk mitigation:** Early identification of technological, regulatory, and market risks;
- **Operational efficiency:** Improved resource productivity and reduced waste;
- **Innovation and competitiveness:** Development of new value propositions and revenue streams;
- **Stakeholder alignment:** Enhanced coordination across departments and supply-chain partners;
- **Regulatory compliance:** Alignment with EU circular economy policies, sustainable product requirements, and ESG expectations.

For SMEs, roadmaps offer a practical, step-by-step approach that reduces complexity and supports informed decision-making.

13.3.3. Support of Chambers for a Circular Economy

Chambers of commerce and industry play a pivotal role in accelerating the circular transition of enterprises, particularly small and medium-sized enterprises (SMEs). As

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intermediary institutions embedded within regional and national economic ecosystems, they provide structural support, capacity-building, and coordination mechanisms that enable companies to adopt circular practices more effectively. Their role extends beyond advisory functions and encompasses systemic facilitation, policy alignment, and the creation of collaborative environments conducive to circular innovation.

Purpose and Theoretical Foundation

The involvement of chambers in the circular economy is grounded in theories of innovation ecosystems, industrial symbiosis, and institutional support structures. These frameworks emphasize that circular transformation is not solely a firm-level process but a network-based transition, requiring:

- cross-sectoral collaboration,
- knowledge exchange,
- shared infrastructure,
- coordinated policy implementation,
- and collective capacity-building.

Chambers act as boundary organizations, bridging the gap between enterprises, policymakers, research institutions, and civil society. Their purpose is to create enabling conditions for circularity by reducing information asymmetries, lowering transaction costs, and supporting companies in navigating regulatory, technological, and market complexities.

Methodological Structure

Chambers typically employ a structured support model composed of several interrelated components:

a) Diagnostic and advisory services - Assessment of companies' circular maturity, resource efficiency, and innovation potential, often using standardized tools or sector-specific methodologies;

b) Capacity-building and training programs - Workshops, seminars, and tailored training modules on circular business models, eco-design, waste valorization, digital traceability, and regulatory compliance;

c) Facilitation of industrial symbiosis - Identification and matchmaking of companies that can exchange materials, energy, by-products, or services, thereby creating closed-loop value chains;

d) Innovation and project development support - Assistance in preparing project proposals, accessing funding, and forming consortia for circular innovation initiatives;

e) Policy interpretation and regulatory guidance - Translation of EU and national circular economy policies into actionable guidance for enterprises;

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f) Knowledge dissemination and best-practice sharing - Publication of case studies, guidelines, and sectoral analyses to support evidence-based decision-making.

This methodological structure ensures that chambers provide both strategic and operational support.

Implementation Process

The implementation of chamber-based circular support typically follows a multi-stage process:

a) Engagement and needs assessment - Chambers initiate dialogue with enterprises to identify sector-specific challenges, resource inefficiencies, and innovation opportunities.

b) Tailored intervention design - Based on the assessment, chambers develop customized support packages, which may include training, advisory services, or participation in collaborative projects.

c) Execution of support activities - Delivery of workshops, expert consultations, symbiosis matchmaking sessions, and innovation labs.

d) Monitoring and evaluation - Chambers track progress through KPIs, feedback loops, and follow-up assessments to ensure continuous improvement.

e) Scaling and ecosystem integration - Successful practices are disseminated across sectors and regions, contributing to broader systemic transformation.

This iterative process enables chambers to adapt their support to evolving market conditions, regulatory frameworks, and technological developments.

Strategic Value for Enterprises

Chamber-based support provides enterprises with several strategic advantages:

- **Reduced complexity:** Simplifies the navigation of circular economy regulations, standards, and funding mechanisms;
- **Enhanced innovation capacity:** Access to expertise, networks, and collaborative platforms accelerates the development of circular solutions;
- **Operational efficiency:** Identification of resource-saving opportunities and symbiosis partnerships lowers costs and increases competitiveness;
- **Risk mitigation:** Expert guidance reduces the likelihood of misaligned investments or non-compliance with emerging regulations;
- **Market differentiation:** Adoption of circular practices strengthens brand reputation and opens new market segments;
- **Access to funding:** Chambers often facilitate entry into EU and national funding programs for circular innovation.

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For SMEs, chambers serve as a critical support infrastructure that compensates for limited internal resources and expertise.

13.3.4. EU Circular Economy Action Plan (CEAP)

The EU Circular Economy Action Plan (CEAP), adopted in 2020 as a core pillar of the European Green Deal, is the European Union's strategic framework for transitioning from a linear "take-make-dispose" model to a regenerative, circular economic system. It aims to transform the entire product life cycle - from design and production to consumption, reuse, repair, and recycling - while strengthening the EU's competitiveness, resilience, and climate neutrality objectives.

Purpose and Theoretical Foundation

The CEAP is grounded in systems thinking, life-cycle approaches, and the concept of decoupling economic growth from resource use. It recognizes that environmental pressures, biodiversity loss, and climate change are tightly linked to unsustainable patterns of production and consumption.

Its core purposes are to:

- establish a sustainable product policy framework,
- keep products, materials, and resources in the economy for as long as possible,
- minimize waste generation and environmental impacts across value chains,
- and support a just, climate-neutral, resource-efficient, and competitive economy.

The plan is explicitly aligned with the European Green Deal and positions circularity as a precondition for long-term competitiveness and strategic autonomy.

Methodological Structure

The CEAP is structured around a set of interlinked policy initiatives and priority value chains, operationalized through legislative proposals, regulatory reforms, and support measures.

a) Sustainable product policy framework - The CEAP introduces a comprehensive framework to make sustainable products the norm in the EU, including:

- ecodesign requirements for durability, reparability, and recyclability,
- restrictions on single-use and premature obsolescence,
- requirements for recycled content and material efficiency,
- digital product passports and transparency on environmental performance.

b) Key product value chains - The plan focuses on sectors with high resource use and circular potential, such as:

- electronics and ICT,
- batteries and vehicles,

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- packaging,
- plastics,
- textiles,
- construction and buildings,
- food, water, and nutrients.

c) Waste prevention and management - The CEAP strengthens waste legislation to prioritize prevention, preparation for reuse, and high-quality recycling, while reducing landfilling and incineration;

d) Horizontal enablers - These include innovation support, digitalization, skills development, green public procurement, and financial instruments to accelerate circular business models.

Implementation Process

The implementation of the CEAP follows a phased and multi-level governance approach:

a) Legislative initiatives - The European Commission proposes regulations and directives (e.g., on sustainable products, batteries, packaging, construction products), which are then negotiated and adopted by the EU institutions.

b) National and regional transposition - Member States integrate CEAP-related requirements into national legislation, strategies, and support schemes, often complemented by regional circular economy roadmaps.

c) Sectoral and value-chain initiatives - Industry alliances, standardization bodies, and sectoral platforms develop guidelines, voluntary agreements, and standards aligned with CEAP objectives.

d) Monitoring and evaluation - Progress is tracked through indicators on resource productivity, waste generation, recycling rates, and circular material use, feeding into regular reporting and policy updates.

This iterative process allows the CEAP to evolve in response to technological advances, market developments, and geopolitical challenges.

Strategic Value for Enterprises

For enterprises - especially SMEs - the CEAP is both a regulatory driver and a strategic opportunity:

- **Market predictability:** Clear long-term direction on product requirements, waste rules, and circular standards;
- **Innovation incentives:** Strong policy push for eco-design, circular business models, and digital solutions (e.g., product passports);
- **Cost and risk reduction:** Improved resource efficiency, reduced dependency on critical raw materials, and better resilience to supply disruptions;

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- **Access to new markets:** Growing demand for sustainable products, repair and remanufacturing services, and secondary raw materials;
- **Alignment with ESG and finance:** Circular practices support compliance with sustainability reporting, taxonomy, and green finance criteria.

For SMEs, understanding CEAP is essential to anticipate regulatory changes, position themselves competitively, and access funding for circular innovation.

13.3.5. Tools from Circular Economy Innovation Hubs

Circular Economy Innovation Hubs (CEIHs) are specialized institutions that support enterprises - particularly SMEs - in developing, testing, and scaling circular solutions. They function as innovation intermediaries, providing access to technical expertise, digital tools, collaborative platforms, and demonstration environments. Their role is to accelerate the adoption of circular business models by reducing technological, financial, and knowledge-related barriers.

Purpose and Theoretical Foundation

The activities of Circular Economy Innovation Hubs are grounded in theories of innovation ecosystems, transition management, and industrial symbiosis. These frameworks emphasize that circular transformation requires:

- systemic collaboration across value chains,
- shared infrastructures for experimentation,
- cross-disciplinary knowledge exchange,
- and coordinated innovation processes.

The primary purpose of CEIH tools is to operationalize circular economy principles by providing enterprises with practical, evidence-based instruments that support:

- circular design and material innovation,
- resource efficiency and waste valorisation,
- digital traceability and data-driven decision-making,
- development of circular business models,
- and scaling of circular solutions through partnerships and pilots.

Innovation hubs thus act as catalysts for systemic change, bridging the gap between research, industry, and policy.

Methodological Structure

Tools offered by Circular Economy Innovation Hubs typically follow a structured methodology composed of several categories:

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a) Diagnostic and analytical tools - These tools assess material flows, carbon footprints, circular maturity, and resource efficiency. Examples include:

- material flow analysis (MFA),
- life cycle assessment (LCA),
- circularity indicators and maturity models,
- CO₂ and environmental impact calculators.

b) Design and innovation tools - Supporting the development of circular products and services through:

- eco-design frameworks,
- modularity and reparability guidelines,
- digital product passport templates,
- prototyping and testing environments (labs, maker spaces).

c) Business model development tools - Methodologies for designing and validating circular business models, such as:

- service-based models (PSS),
- leasing and sharing models,
- remanufacturing and refurbishment strategies,
- value proposition design for circular offerings.

d) Digital and data-driven tools - Tools that enable traceability, transparency, and optimization:

- digital twins,
- blockchain-based traceability systems,
- resource-tracking platforms,
- decision-support systems for circular operations.

e) Collaboration and matchmaking tools - Platforms that facilitate industrial symbiosis and cross-sectoral cooperation:

- symbiosis matchmaking databases,
- partner-search platforms,
- shared knowledge repositories.

Together, these tools form a comprehensive support system for circular innovation.

Implementation Process

The implementation of CEIH tools typically follows a multi-stage process:

a) Needs assessment and problem definition - Enterprises work with hub experts to identify challenges, inefficiencies, and circular opportunities.

b) Tool selection and customization - Based on the assessment, the hub selects appropriate tools and adapts them to the company's sector, maturity level, and strategic objectives.

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c) Application and experimentation - Tools are applied through workshops, pilot projects, prototyping sessions, or digital simulations. This phase often includes testing new materials, redesigning products, or validating business models.

d) Evaluation and refinement - Results are analyzed using KPIs and performance indicators. Insights are used to refine solutions and inform strategic decisions.

e) Scaling and integration - Successful solutions are scaled across the organization or value chain, supported by the hub's networks, funding guidance, and technical expertise.

This iterative process ensures that innovation is both technically feasible and economically viable.

Strategic Value for Enterprises

Tools provided by Circular Economy Innovation Hubs offer enterprises several strategic advantages:

- **Accelerated innovation:** Access to advanced methodologies, labs, and expert knowledge reduces development time;
- **Reduced risk:** Testing solutions in controlled environments minimizes investment risks;
- **Improved resource efficiency:** Analytical tools identify cost-saving opportunities and optimize material use;
- **Enhanced competitiveness:** Circular products and services open new markets and strengthen brand differentiation;
- **Technological readiness:** Digital tools support compliance with emerging EU requirements (e.g., digital product passports);
- **Collaborative advantage:** Matchmaking tools enable partnerships for industrial symbiosis and joint innovation.

For SMEs, hubs provide capabilities that would otherwise be inaccessible due to limited internal resources.

Table 15: Summary of tools supporting the circular transition of SMEs

Instrument	Purpose & Theoretical Foundation (What it helps you do)	Methodological Structure	Implementation Process (How to use)	Strategic Value for Enterprises
Circular Readiness Assessment-Ready2LOOP	Based on circular economy maturity models, systems thinking, and organizational	Structured questionnaire; maturity indicators; qualitative & quantitative metrics; gap	Self-assessment → analytical synthesis → prioritization → access to tools → roadmap development.	Clear baseline; targeted interventions; reduced risk; improved resource efficiency;

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	capability assessment. Helps companies understand their readiness for circular transition.	identification; prioritization logic.		supports strategic planning.
Circular Transition Roadmaps	Grounded in transition management, lifecycle thinking, and strategic planning theory. Provides long-term direction for circular transformation.	Baseline assessment; opportunity mapping; gap analysis; prioritization; time-bound roadmap with milestones, KPIs, governance.	Stakeholder engagement → pilot testing → scaling → monitoring & continuous improvement.	Long-term clarity; structured transformation; risk mitigation; innovation acceleration; regulatory preparedness.
Chambers for a Circular Economy	Based on innovation ecosystem theory, industrial symbiosis, and institutional support frameworks. Acts as intermediary for circular transition.	Advisory services; training; symbiosis matchmaking; project development; policy guidance; knowledge dissemination.	Needs assessment → tailored support → delivery of services → monitoring → ecosystem scaling.	Reduced complexity; access to expertise; improved competitiveness; funding access; collaborative advantage.
EU Circular Economy Action Plan (CEAP)	Rooted in systems thinking, decoupling theory, and lifecycle sustainability. Provides EU-wide regulatory and strategic framework.	Sustainable product policy; priority value chains; waste prevention; horizontal enablers (innovation, skills, digitalization).	Legislative proposals → national transposition → sectoral initiatives → monitoring & evaluation.	Market predictability; innovation incentives; cost reduction; compliance with EU requirements; new market opportunities.
Tools from Circular Economy Innovation Hubs	Based on innovation ecosystem theory, experimentation frameworks, and industrial symbiosis. Enable practical testing and scaling of circular solutions.	Diagnostic tools (MFA, LCA); design tools; business model tools; digital tools; collaboration platforms.	Needs assessment → tool selection → experimentation → evaluation → scaling.	Accelerated innovation; reduced risk; improved resource efficiency; technological readiness; access to networks.

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WHAT THIS MEANS FOR ENTERPRISES

SMEs can leverage these tools to strengthen their circular transformation in several critical ways. By integrating diagnostic instruments, strategic planning frameworks, support services, and innovation platforms, companies gain a structured pathway toward more sustainable and competitive operations.

1. Assess their readiness for circular transformation

SMEs obtain a clear, evidence-based understanding of their current circular maturity, organizational capabilities, and systemic gaps. This diagnostic insight helps them identify where they stand in relation to best practices and regulatory expectations.

2. Develop a clear and actionable transition plan

The tools provide structured guidance for defining priorities, sequencing interventions, and allocating resources. This results in a coherent action plan that reduces uncertainty and supports informed decision-making across departments.

3. Select the most appropriate circular business models

Through analytical frameworks and expert support, SMEs can evaluate which circular strategies - such as product-as-a-service, remanufacturing, reuse systems, or resource-efficient production - are most feasible and impactful for their specific context.

4. Reduce costs and minimize waste

By optimizing material flows, improving resource efficiency, and identifying opportunities for reuse or valorization, companies can significantly lower operational costs while reducing environmental impacts.

5. Strengthen competitiveness and market positioning

Circular practices enhance product value, differentiate companies in increasingly sustainability-driven markets, and improve resilience to resource volatility. This positions SMEs more strongly in both domestic and international value chains.

6. Access funding, partnerships, and innovation projects

Many EU and national funding schemes prioritize circular economy initiatives. These tools help SMEs demonstrate readiness, align with policy priorities, and participate in collaborative innovation projects, thereby unlocking financial and strategic opportunities.

Final Remarks

The transition to a circular economy represents a strategic opportunity for the furniture sector. By adopting circular principles, companies can enhance their competitiveness, resilience, and contribution to sustainable development. The guidelines presented in this brochure aim to support SMEs in taking practical and achievable steps towards a more circular future.

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Annex 1: Database of learning materials for the transition to Circular economy

Name of learning materials	Source / Links
Guide on the EU Waste Framework Directive (WFD) and Extended Producer Responsibility (EPR)	https://zelenaekonomija.komorabih.ba/vodic-o-eu-direktivi-o-otpadu-wfd-i-prosirenoj-odgovornosti-proizvodjaca-epr/
Circular Economy Guide – Supporting the Transition from a Linear to a Circular Economy	https://crownproject.biz/wp-content/uploads/2021/01/CE-guide-for-web.pdf
The Ultimate Guide to the Circular Economy	https://cirekon.rs/ultimativni-vodic-kroz-cirkularnu-ekonomiju/
Handbook for Circular Product Design	https://files.acquia.undp.org/public/migration/rs/0fd7ec08950be00e373aaa4bc9273bd22611dc7c9591be79d30044cc451dee3e.pdf
Circular Business Models	https://www.researchgate.net/profile/Ljiljan-Veselinovic/publication/396005181_CIRKULARNI_POSLOVNI_MODELI/links/68dc14179383755fd7085fcf/CIRKULARNI-POSLOVNI-MODELI.pdf?_tp=eyJjb250ZXh0Ijp7ImZpcnNOUGFnZSI6InB1YmxpY2F0aW9uIiwicGFnZSI6InB1YmxpY2F0aW9uIiwiaWF0Ijoi
White Paper on the Circular Economy in Bosnia and Herzegovina	https://zelenaekonomija.komorabih.ba/wp-content/uploads/2023/10/Bijeli_Papir_Publikacija_28042022.pdf
Circular economy opportunities in the furniture sector	https://eeb.org/wp-content/uploads/2019/05/Report-on-the-Circular-Economy-in-the-Furniture-Sector.pdf
WOODCircle Learning Platform	https://course.woodcircle.net/
Circular Economy in the wood and Furniture Sector (Module 2:	http://making40.eu/index.php/przykladowa-strona/module2/

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Training programmes & practical tools	https://www.interregeurope.eu/good-practices/scce-slovenian-centre-for-circular-economy
Circular Economy Training Pack (5 modules)	https://www.climatehub.si/en/solutions/innovative-solutions/transitional-economy/
Digital Card Set – 5R Principles	https://www.climatehub.si/en/solutions/innovative-solutions/transitional-economy/
Skills Taxonomy	https://www.climatehub.si/en/solutions/innovative-solutions/transitional-economy/
Practical Guidelines: “The Circular Economy – Moving from Theory to Practice”	https://www.climatehub.si/en/solutions/innovative-solutions/transitional-economy/
Systemic transition pathways & learning materials	https://www.climate-kic.org/programmes/place-based-transformations/circular-slovenia/
National CE reforms, investments & guidelines	https://www.gov.si/en/registries/projects/the-recovery-and-resilience-plan/about-the-recovery-and-resilience-plan/green-transition/circular-economy-resource-efficiency/
Handbook for facilitating the Circular Economy Transition in the EU furniture industry	https://furncircle.eu/downloads
Implementation of circular business models in the furniture sector	https://build360.ie/furn360/
FURN360 Circular Economy Coursebook	https://ec.europa.eu/programmes/erasmus-plus/project-result-content/15458506-c7ee-470f-a4be-61899a13a741/FURN360_-_coursebook.pdf
Cir4Fun – Circular Furniture Roadmap and Supporting Materials	https://cir4fun.eu/
Mapping existing Circular Economy Learning Resources in Furniture	https://cpi.si/wp-content/uploads/2022/01/D2.1-Mapping-existing-Circular-Economy-Learning-Resources-in-Furniture.pdf
A practical approach to the circular economy in business	http://qarkonomi.al/kurset/
Green skills for green jobs	http://qarkonomi.al/kurset/

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FURN360: a circular training curriculum for the furniture sector	https://circulareconomy.europa.eu/platform/en/education/furn360-circular-training-curriculum-furniture-sector
TwinRevolution e-learning course: Exploring Twin Digital and Green Transition in Manufacturing Industry	https://circulareconomy.europa.eu/platform/en/education/twinrevolution-e-learning-course-exploring-twin-digital-and-green-transition-manufacturing-industry
(Introduction to the) Circular Economy - an e-course and a webinar to better understand circularity	https://circulareconomy.europa.eu/platform/en/education/introduction-circular-economy-e-course-and-webinar-better-understand-circularity
Menadžerski vodič za kružno gospodarstvo	https://hrpsor.hr/admin/uploads/blog/Menadzerski_vodic_za_kruzno_gospodarstvo1.pdf
Bioloc Hrvatska	https://hr.bioloc.eu/edukacija/
PROCEDIN Resource Bank: A comprehensive EU database mapping education in circular procurement and sustainability	https://procedin.eu/database-of-european-education-provision/
World Bank & Ministry of Economy Hub	https://www.worldbank.org/en/country/croatia/brief/croatia-circular-economy-approaches-in-solid-waste-management
ECOPATH (Sustainability & ESG for SMEs)	https://rk-smz.hr/gamificirana-edukacija-o-esg-u-i-kruznom-gospodarstvu-za-msp-ove/
HGK Digitalna Komora (Digital Chamber)	https://digitalnakomora.hr/
Hrčak & ZIR (Academic Databases)	https://hrcak.srce.hr/
Ellen MacArthur Foundation – Circular Design Guide	https://www.ellenmacarthurfoundation.org/circular-design-guide/overview
EIT Climate-KIC – Circular Economy Courses	https://www.eit.europa.eu/our-activities/opportunities/eit-climate-kic-launches-new-series-circular-economy-courses



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EU Joint Research Centre – https://research-and-innovation.ec.europa.eu/research-area/environment/circular-economy_en
Circular Economy Indicators and
Guidance

Furncircle project - handbook for <https://furncircle.eu/downloads>
CE furniture industry

New European Bauhaus <https://neb.academy/courses>
Academy

FLIER on-line training course for <https://course.flierproject.ambitcluster.org/>
Circular Furniture Designers

CriCLER Training course <https://circler-furniture.eu/en/downloads>

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Annex 2: Database of relevant institutions and associations for support SMEs transitioning to the Circular Economy

Institution and association name	Adress
Foreign Trade Chamber of Bosnia and Herzegovina	Branislava Đurđeva 10, 71000 Sarajevo, B&H
Chamber of Commerce of Federation of Bosnia and Herzegovina	Branislava Đurđeva 10, 71000 Sarajevo, B&H
Government of Federation of Bosnia and Herzegovina - Federal Ministry of Development, Entrepreneurship and Crafts	Braće Fejića 43, Mostar, B&H
United Nations Development Programme (UNDP) in B&H	Zmaja od Bosne b.b, 71000 Sarajevo, B&H
Chamber of Commerce of Republic of Srpska	Branka Ćopić 6, 78000 Banja Luka, B&H
Ministry of Foreign Trade and Economic Relations of B&H	Musala 9, 71000 Sarajevo, B&H
Government of R. Srpska - Ministry of Economy and Entrepreneurship	Trg Republike Srpske 1, 78000 Banja Luka, B&H
Government of R. Srpska - Ministry Energy and Mining	Trg Republike Srpske 1, 78000 Banja Luka, B&H
Environmental Protection and Energy Efficiency Fund of the R. Srpska	Kralja Alfona XIII 21, 78000 Banja Luka, B&H
Government of R. Srpska - Ministry of Spatial Planning, Construction and Ecology	Trg Republike Srpske 1, 78000 Banja Luka, B&H
Environment Protection Fund of the Federation of B&H	Hamdije Čemerlića 39A, 71000 Sarajevo, B&H
Government of FB&H – Federal Ministry of Environment and Tourism	Hamdije Čemerlića 2, 71000 Sarajevo, B&H
Slovenian center for circular economy (CoC and Industry of Slovenia)	Dimičeva ulica 13, 1504 Ljubljana, Slovenia
Slovenian Enterprise Fund	Ulica kneza Koclja 22, 2000 Maribor, Slovenia
Association of the Wood and Furniture Industry	Dimičeva ulica 13, 1504 Ljubljana, Slovenia
Chamber of Commerce and Industry of Slovenia	Dimičeva ulica 13, 1504 Ljubljana, Slovenia
Government of Slovenia - Ministry of the Environment, Climate and Energy	Dunajska 48, 1000 Ljubljana, Slovenia
Government of Slovenia - Ministry of the Economy, Tourism and Sport	Kotnikova 5, 1000 Ljubljana, Slovenia
E-Institute	Brežice/Velenje, Slovenia
Hellenic Society for Circular Economy	https://hsce.gr/
Circular Economy Implementation in Greece	https://circulargreece.gr/
Hellenic Green Fund	https://prasinotameio.gr/
IME GSEVEE (Small Enterprises Institute of GSEVEE)	https://imegsevee.gr/
InCommon – Environmental & Circular Economy Community Organisation	https://www.incommon.gr/
Technical Chamber of Greece (TEE – TCG)	https://www.tee.gr/
Government of Albania - Ministry of Tourism and Environment	Bulevardi Dëshmorët e Kombit, Tirana, Albania
National Agency of Environment	Rruga Sami Frashëri, Nr. 4, Tiranë, Albania

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Konfindustria – Confederation of Industries of Albania	Rruga Abdyl Frashëri, Tirana, Albania
American Chamber of Commerce in Albania (AmCham)	Rruga Papa Gjon Pali II, Tirana, Albania
Business Network Albania (BNA)	Rruga Sami Frashëri, Tirana, Albania
Institute for Environmental Policy in Albania	Rruga Myslym Shyri, Tirana, Albania
Recycling Albania (RecycAL) - NGO / Initiative	Durrës, Albania
Agricultural University of Tirana	Kamëz, Tirana, Albania
Government of R. Croatia - Ministry of Foreign and European Affairs	Trg N.Š. Zrinskog 7-8, 10000 Zagreb, Croatia
Government of R. Croatia - Ministry of Environmental Protection and Green Transition	Radnička cesta 80, 10000 Zagreb, Croatia
Croatian Agency for SMEs, Innovation and Investments (HAMAG-BICRO)	Ksaver 208, 10000 Zagreb, Croatia
Croatian Chamber of Economy	Rooseveltov trg 2, 10000 Zagreb, Croatia
Croatian Bank for Reconstruction and Development	Strossmayerov trg 9, 10000 Zagreb, Croatia
Environmental Protection and Energy Efficiency Fund	Radnička cesta 80, 10000 Zagreb, Croatia
Enterprise Euro Network Croatia	Rooseveltov trg 2, 10000 Zagreb, Croatia
Vukovar-Srijem County Development Agency	Antuna Akšamovića 31, 32100 Vinkovci, Croatia
Government of R. Croatia - Ministry of Economy and Sustainable Development	Radnička cesta 80, 10000 Zagreb, Croatia
HUP – Udruga malih i srednjih poduzetnika (Association of SMEs)	Radnička cesta 37a, 10 000 Zagreb, Croatia
CEPOR (Center for SME Policy and Entrepreneurship)	Trg J.F.Kennedya 7, 10000 Zagreb, Croatia
Osijek-Baranja County Development Agency	Stjepana Radića 4, 31000 Osijek, Croatia
Government of R. Croatia - Ministry of Agriculture, Forestry and Fisheries	Ul. Grada Vukovara 78, 10000 Zagreb, Croatia
Chamber of Commerce and Industry of Serbia	Resavska 13–15, 11000 Belgrade, Serbia
Serbian Development Agency (RAS)	Kneza Miloša 12, 11000 Belgrade, Serbia
Innovation Fund of Serbia	Veljka Dugoševića 54, 11000 Belgrade, Serbia
European Furniture Industries Confederation	Rue Montoyer 24, 1000 Brussels, Belgium
CEI-Bois	Rue Montoyer 24, 1000 Brussels, Belgium
GO Furniture (European meta-cluster)	https://gofurniture.eu/
EFIC (Confederation)	https://www.efic.eu/
APE FVG (Agency for Energy of Friuli Venezia Giulia)	https://www.ape.fvg.it/ info@ape.fvg.it
Sprint FVG	https://sprintfvg.it/ segreteria@sprint@finest.it
IP4FVG	https://www.ip4fvg.it/living-lab-ams-advanced-manufacturing-solutions/ contatti@ip4fvg.it
Confindustria (Alto Adriatico, Udine, CONFAPI FVG)	https://www.confindustriaaltoadriatico.it/ https://www.confindustria.ud.it/ https://www.confapifvg.it/



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Annex 3: Online databases and tools for the circular economy

Databases and tools name	Databases and tools link	Short description of the database and tools
Digital platform for trading secondary raw materials in Bosnia and Herzegovina	https://reusechain.ba/	<p>ReUseChain is the first digital B2B platform in B&H dedicated to the sale and purchase of secondary raw materials and industrial waste. It helps companies reduce operational costs, emissions, and waste volumes-while at the same time contributing to the development of the circular economy and sustainable business practices. ReUseChain.ba enables companies to directly advertise surplus raw materials - plastic, wood, metal, textiles, paper, or construction waste - without intermediaries or additional costs. The platform is available to all legal entities in B&H through an annual membership fee, with different packages tailored to the size and needs of businesses, ranging from small enterprises to large systems. The platform enables:</p> <ul style="list-style-type: none"> • Connecting business entities interested in exchanging surplus raw materials and industrial waste • Easy listing and searching of materials across categories such as plastics, metals, glass, paper, textiles, electronics, wood, food and agricultural waste, and rubber • ESG support and impact-tracking tools, helping companies align



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	<p>with environmental, social, and governance standards</p> <ul style="list-style-type: none"> • Secure communication and flexible transaction models, including options that protect both parties • User verification and categorization to strengthen trust, security, and the prevention of misuse
<p>Questionnaire for Self-Assessment of Circularity and Circular Maturity https://zelenatranzicija.ba/bs-Latn-BA/circular-pulse</p>	<p>A questionnaire for self-assessment of circularity and circular maturity of companies, which enables the identification of key opportunities for optimizing business operations in line with the principles of sustainability and the circular economy. After completing the questionnaire, companies receive a comprehensive report on the current level of circular practices, along with a set of tailored recommendations for business optimization. Through this report, companies are enabled to:</p> <ul style="list-style-type: none"> • Identify key areas for improving sustainability within their operations, • Discover untapped opportunities for growth and innovation, • Access a customized set of recommendations to guide their business towards a more sustainable future
<p>Digital Platform for the Circular Economy (CE-HUB) https://circulareconomy-serbia.com/sr</p>	<p>The Digital Platform for the Circular Economy (CE-HUB) represents a source of knowledge and activities primarily</p>



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		intended for the Serbian business sector, supporting its transition towards green investments. It provides support to companies through business models, examples of good practices, and practical tools, enabling them to more easily adopt circular business models, reduce the carbon footprint of their production processes and products, and thereby maintain competitiveness in European and international markets
Statistical Office of the Republic of Slovenia	https://pxweb.stat.si/SiStat/si/Podrocja/Index/99/okolje	Material flow indicators, waste (generation, recycling, treatment), energy consumption and emissions and environmental accounts
European Information Network and Environment Observation	https://www.eionet.europa.eu/	Databases on waste and recycling, data on material flows and resource productivity, data on emissions and energy consumption, and environmental accounts and indicators. Analytical and support tools relevant to the circular economy include circular economy indicators, thematic portals (waste, resources, climate), policy and scenario assessment tools, and visualisations and dashboards to support decision-making.
EuroStat	https://ec.europa.eu/eurostat/web/circular-economy	Information about, production and consumption, waste management, secondary raw materials, competitiveness and innovation, global sustainability and resilience
FurnCIRCLE – EU Circular Economy Tool for the Furniture Industry	https://furncircle.eu/	A dedicated EU-level platform designed specifically for furniture manufacturers. It provides:



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	<ul style="list-style-type: none"> • a self-assessment tool for circular maturity, • practical guidelines for circular transition, • EU-wide survey data on circularity in furniture, • recommendations for skills and training needs.
<p>Slovenian Centre for Circular Economy (SCKG) – Online Platform https://www.sckg.si/en/</p>	<p>The national platform for circular economy in Slovenia, offering:</p> <ul style="list-style-type: none"> • virtual entry points, • training materials, • advisory tools, • access to circular economy experts, • support for SMEs across all sectors, including wood and furniture. <p>The platform was established by the Chamber of Commerce and Industry of Slovenia and operates through 12 regional entry points.</p>
<p>GOV.SI – Circular Economy & Resource Efficiency Portal www.gov.si/en/.../circular-economy-resource-efficiency/</p>	<p>The Slovenian government's official portal for circular economy reforms and investments. Relevant for furniture SMEs because it includes:</p> <ul style="list-style-type: none"> • national funding opportunities, • investments in the wood-processing chain, • guidelines for green and circular transition.
<p>European Circular Economy Stakeholder Platform https://circulareconomy.europa.eu/platform/en</p>	<p>EU portal that provides access to good practices, toolboxes, educational resources, financing sources, case studies, and policy</p>



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				guidance relevant to circular economy implementation.
Eurostat Database	Circular Economy		https://ec.europa.eu/eurostat/web/circular-economy/database	EU database with indicators and datasets on production and consumption, waste management, secondary raw materials, competitiveness and innovation.
European Stakeholder Platform – Toolbox	Circular Economy		https://circulareconomy.europa.eu/platform/en/toolbox	Tools, toolkits, and methods for measuring circularity, evaluating systems, identifying financing channels for circular economy initiatives, and adopting circular strategies.
Circular Economy Toolkit			https://www.clustercollaboration.eu/content/circular-economy-toolkit	The Circular Economy Toolkit supports businesses in developing more environmentally sound decisions by identifying circular economy opportunities and providing information on how a company could start finding benefits.
Circularity Platform			https://circularity.com/en/circularity-platform-eng/	The Circularity Platform: a tool designed for companies to digitize the measurement activities of their sustainability, circular economy and environmental impact performances through various integrated tools.
Up2Circ – Circularity Platforms and Guides			https://up2circ.eu/circularity-platforms-and-guides/	A repository of circular economy platforms and online guides designed to empower businesses and innovation advisors with comprehensive knowledge, tools, and insights into circular economy practices.
Interreg Good Practices Map			https://www.interregeurope.eu/policy-solutions/good-practices	A collection of identified good practices, including the circulation of furniture and the circular economy projects and policies.
National Agency of Environment				Public data & reporting platform Waste, Environmental indicators, Resource management, Regulatory data, Compliance information



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European Circular Economy Stakeholder Platform	https://circulareconomy.europa.eu/platform/en/education	European Platform offering programmes, projects and education and training seminars
EduZWaCe Knowledge Hub	https://khub.eduzwace.eu/	The Knowledge Hub is an interactive resource centre, which gathers useful information for Vocational Education and Training teachers and professionals from companies who seek for knowledge and inspiration on zero waste and circular economy.
ECOcircular-AI	https://elearning.ecocircular-ai.eu/	This platform hosts an educational game as a series of challenges, and is your gateway to learning about the principles of circular economy through interactive educational materials, supported by an AI chatbot assistant, a comprehensive trainers' pack, a detailed users' guide, and a discussion forum.
Digitalna komora – Burza otpada (Waste Exchange)	https://digitalnakomora.hr/	It functions like an "eBay for waste." Companies can post ads to sell their industrial by-products (e.g., wood shavings, sawdust, or fabric scraps) or search for secondary raw materials to use in their production.
Kruzna-ekonomija.com (Portal for Circular Economy)	https://kruzna-ekonomija.com/	It tracks the latest changes in Croatian waste laws, the "End-of-Waste" status (vital for turning waste into a product), and alerts for new national grants.
DECIDE Project Toolbox (Danube Region)	https://interreg-danube.eu/projects/decide	It provides Business Model Canvases specifically designed for circularity. You can look at case studies of successful Croatian companies like Humana Nova (textiles) to see how they structured their "social-circular" business model.



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JRPI (Single Register of Entrepreneurial Infrastructure)	https://www.google.com/search?q=https://jrpi.mingo.hr	A database of all business zones and supporting institutions (incubators, technology centers) in Croatia. Used by SMEs to find nearby facilities in Vukovar-Srijem County (like the Gradište business zone) that offer infrastructure for circular operations such as sorting or shared storage.
ISGO – Croatian Circular Economy Portal	https://isgo-portal.haop.hr/hr	Official national online portal of Croatia that provides data, indicators and reports related to the country's transition to a circular economy
Croatian Bureau of Statistics (CBS)	https://podaci.dzs.hr/hr/	Official national provider of statistical data in Croatia and a key data source for monitoring the Circular Economy (e.g., waste statistics, resource productivity)
European Circular Economy Stakeholder Platform	https://circulareconomy.europa.eu/platform/en/toolbox	Database of circular economy good practices, tools, policies and SME-oriented case studies
Ellen MacArthur Foundation – Knowledge Hub	https://www.ellenmacarthurfoundation.org/explore?sortBy=dateDesc	Practical guidance on circular design, product life extension and business model innovation
Circular Economy Toolkit	http://circulareconomytoolkit.org/	Step-by-step tools to help SMEs identify circular opportunities in products and processes
CirCLER self-assessment tool	https://assessment.circler-furniture.eu/	
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