HANDBOOK FOR FACILITATING THE **CIRCULAR ECONOMY TRANSITION** IN THE EU FURNITURE INDUSTRY H

A guide for companies and stakeholders
for enhancing their competitiveness
and jobs attractiveness

Preliminary edition

Co-funded by
the European Union

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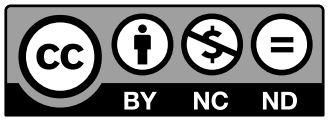


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2 summary

In the current scenario, which is characterised by significant environmental challenges and a complex global economic and social context, there is a clear need to transition towards a more resilient system that can benefit businesses, people and the environment. This handbook is designed to serve as a reference for the European furniture industry, guiding it towards a circular transition through an examination of the fundamentals of the new economic model, the identification of challenges, and the exploration of opportunities. The circular transition strategy, which has emerged in recent decades and is considered the most effective by both scientists and expert economists, moves away from consumerism and planned obsolescence. The greatest benefits are perceived when it is applied across all business areas.

The guide begins with an introduction to the differences between linear and circular economies, and the presentation of the CANVAS business model, which forms the basis of this guide.

The following chapter presents the current status of the furniture sector, outlining the key challenges and opportunities facing the industry. The European furniture industry is a significant contributor to the European economy, with revenues exceeding 100 billion euros. Its success is built on a foundation of design excellence and high-quality products, which require a substantial input of materials. However, this also generates a significant amount of waste. The market relevance of the furniture sector, along with its potential for improvement in sustainability, has been a key consideration in light of new regulatory policies established by the European Commission. As a result, in addition to energy efficiency, other ecodesign requirements are emerging that must be taken into account, such as recycled content, durability, material recyclability, environmental footprint, and available information, which can generate positive impacts throughout the product life cycle.

We then examine the circular economy in more depth. Unlike the traditional linear economy, the new circular model aims to optimise the use of resources by keeping products and materials in circulation for as long as possible with the maximum value. This is achieved through a series of strategies that contribute to cost savings and business opportunities, while promoting responsible consumption and a regenerative system that helps nature thrive. We focus also on different methodologies and principles that can support and guide companies in their transition towards more circular practices. These include the life cycle approach, the concept of environmental, social and economic benefits, a continuous flow concept, and innovative business models. New digital technologies will play a key role in the development of this model.

In the following chapter, we explain the potentiality of targeting circularity starting from the design phase and how it allows to affect environmental, social and economic dimensions. It is widely accepted that 80% of a product's environmental impact is determined during the design phase. We also present the benefits of having an environmental management system implemented to facilitate the whole process and finally we introduce the different stages for a successful implementation of the circular design in companies.

We then focus on the application of different environmental impact assessment methods, which an increasing number of companies are using to identify and evaluate the effects of their activities associated with their products on the environment. This process assists companies in understanding products from a different perspective and establishing new improvement guidelines regarding material selection, production processes, recyclability, among others. We provide also an example of environmental checklist to start an analysis of the environmental aspects of a product in a simple manner and identify possibilities for improvement.

The following chapter presents up to 30 design and related strategies that can be applied in the furniture industry and that can have impact at various stages of the product life cycle. It also includes real-world examples of hundreds of effective practices that companies can adopt to take tangible steps towards a successful circular transition. It is important to recognise that circular design has a significant impact on different phases of the product life cycle. For the purpose of this guide, these strategies have been grouped according to the phase where their effect materialises, specifically: design phase; material resources phase; production phase; distribution phase; use phase; and end-of-life phase.

Following this section, we examine the most pertinent legislative strategies and actions associated with EU sustainability policies for the furniture sector. These are identified, presented and analysed.

3 introduction

Welcome to our guide on the fundamentals of the circular economy, specifically tailored for the furniture industry. This document is developed within the framework of the European project FurnCIRCLE and serves as a foundational resource to guide companies towards sustainable practices and circular transition.

In an era marked by environmental and social concerns, geopolitical challenges, and resource scarcity on the one hand, but also shaped by technological advances and growing demands for accountability from both consumers and policymakers on the other, the concept of circular economy has gained significant traction as a sustainable alternative to traditional linear economic models.

This shift is critically affecting the furniture sector, prompting companies to adopt more sustainable practices. In this guide, we outline the challenges and solutions, regulatory frameworks, provide examples, and discuss how everything fits within business models.

The linear context

The crises and international tensions of recent years have highlighted the vulnerability of the dominant extract-produce-consume-dispose system, making necessary a profound reflection on the viability of the current economic model. This approach, which has become the most widespread since the Industrial Revolution, is based on consumption and planned obsolescence.

Until now, the production and consumption system has evolved uncontrollably, with little regard for the severe consequences on our environment, such as climate change, ecosystem destruction, and resource overexploitation, among others. Researchers at the Stockholm Resilience Center in Sweden found that six of the so-called planetary boundaries, key processes essential for sustaining life on Earth – including biodiversity, climate change, land and freshwater impacts, biogeochemical cycles, and synthetic chemicals and substances such as microplastics – are already past their safe limit, placing the Earth "well outside of the safe operating space for humanity" in the next coming years (stockholmresilience.org/research/planetary-boundaries.html).

According to the Eurobarometer report published in July 2023, these issues have reached a scale where the reality is undeniable: 93% of European Union citizens believe that climate change is a serious problem for the world, and 58% think that the transition to a green economy must be accelerated. This solution is considered the most effective and is supported by environmentalists, scientists, and expert economists, countering the general belief that environmental protection is too costly and hinders development.

These challenges also affect the furniture sector - considering of course its own specificities - as it involves a straightforward production process where raw materials are extracted, transformed into products, that are generally discarded after use. As we will see in this guide, maintaining the linear approach leads to significant environmental impacts, such as illegal logging deforestation for wood, high energy consumption during manufacturing, and substantial waste generation when furniture is disposed of, among others. The low recycling and reuse rates exacerbate resource depletion, increasing landfill loads and contributing to pollution and carbon emissions, which collectively intensify the sector's environmental footprint. But we want to highlight that this guide is primarily focused on solutions, which open up a very interesting range of potential benefits -also economical ones - for the furniture sector at all levels, as we will see in the next chapters.

The circular model

For several decades, theories have been emerging that link environmental and economic aspects to contribute to sustainable progress, considering that humans are part of the environment and must protect and even promote its development for their own benefit. This is similar to the biological cycles of living beings, which, besides being born, growing, reproducing, and dying, can generate organic matter or other resources that benefit others.

This circular framework is critical to find ways to maintain our well-being while achieving the best possible economic dynamism in the coming years, something that is of course relevant for the furniture sector. It is particularly important that this transition towards a more rational model is carried out in the fairest manner possible for all global citizens and for future generations as well. Their ability to enjoy a life on our planet with conditions akin to ours should not be jeopardized, and this involves that the transition to circularity needs to be addressed urgently from every economic sector, including the furniture sector.

Fit of the Circular Economy in the Company and its Business Model

The appearance of new strategies in the furniture and living spaces sector must be analyzed through the lens of existing, holistic, and easily integrable analytical models, so that it is possible to understand their advantages, disadvantages, and fit within existing business models. The circular economy has emerged strongly in the last two decades as a reinvention of many areas that constitute business models. It is a strategy whose greatest advantages are perceived when it is introduced transversally across all business aspects.

The **CANVAS business model**, which will be used in this guide and is one of the most widespread analytical models, is a tool for analysing the entire value chain, breaking it down into a series of blocks to understand it in its entirety when introducing improvements and analysing the impact throughout the entire business model. The model can be approached in different ways and from different perspectives; in this guide, it will be done through the conceptualization into five blocks. Figure 1 below presents the conceptualization of the CANVAS Business Model into Five Business Blocks, two of them with some Sub-Blocks.

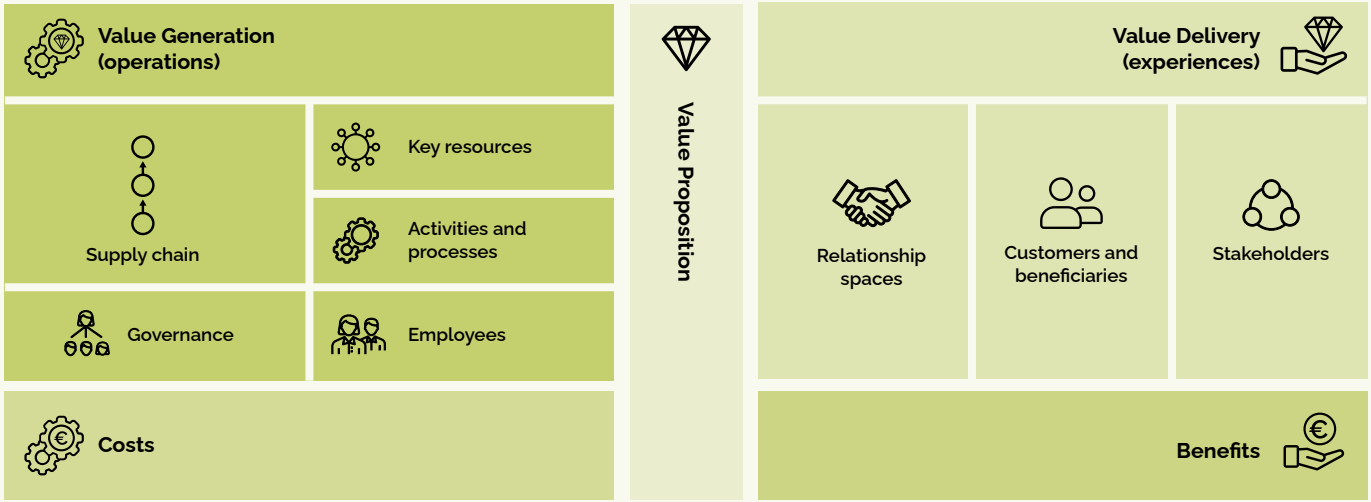


Figure 1 CANVAS Business Model

The core of the CANVAS model lies in defining a Value Proposition, which is the essence and ultimate goal of business models themselves. Without a value proposition that considers environmental aspects, these models can hardly become viable and sustainable. The circular economy presents challenges that companies in our sector must be able to translate into opportunities and competitive advantages. The paradigm shift brought about by accelerated climate change, the limitation of natural resources, and the increasing generation of waste invite us to address these challenges with sustainable value propositions, both in economic, socio-labour, and environmental aspects. All of this aligns easily with the currently called new business models focused on corporate purpose, which introduce other stakeholders and additional environmental, social, economic, and governance benefits beyond the strictly financial. These models satisfy responsible consumption, whether driven by changes in demand or regulatory changes.

To arrive at a viable and sustainable Value Proposition, new costs associated with this strategy, as well as the new benefits it brings, must be analyzed. **The Costs** block, whether involving an increase or reduction, refers to those incurred during value generation processes in operations within the company, as well as upstream. The circular economy can contribute to reducing and optimizing these costs, while potentially increasing them correspondingly with greater benefits and a more attractive value proposition.

The Benefits block, on the other hand, pertains to value delivery processes, related to the experience generated at the time of sale, consumption, and end of life, in processes controlled by the company or downstream. Benefits can increase or decrease depending on the inclusion of a circular economy strategy and its proper implementation, contributing more significantly to the Value Proposition and competitive positioning.

The circular economy proposes changes in all Value Generation processes within operations, to varying degrees. **Value Generation** constitutes one of the five blocks of the CANVAS model. This is evident in key resources and raw materials (from wood to new materials), activities and processes (R&D, human resource training), and the supply chain (new actors, responsible production). Therefore, circularity encourages us to include recycled and more biologically or ecologically sourced inputs, collaborate with suppliers providing new solutions to new social and environmental challenges, and review innovation, production, and service delivery processes that do not generate waste or negative externalities that cannot be valorized.

The fifth block of the CANVAS model, **Value Delivery** processes through experiences, includes all processes carried out with customers, beneficiaries, and stakeholders in relational and encounter spaces, which can also include objects such as packaging, websites, or advertising. For example, the inclusion of servitization

to manage a new end-of-life for products and spaces is part of this value delivery. Servitization involves different groups such as customers, beneficiaries, and other stakeholders, including public administrations, social entities, or local companies, in the value delivery process, contributing positively to the Benefits and Value Proposition blocks.

Another future challenge for our sector, traceability, should also be considered an asset and an opportunity to include in value delivery through experience. This is not possible without the introduction of digitalization throughout the entire value chain, influencing Costs, Benefits, and the Value Proposition in a continuous and evolving interdependence.

What's next?

In this guide, we will explore how the principles of the circular economy can be applied within the furniture sector to promote resource efficiency, minimize waste, and create value throughout the entire product life cycle. From sustainable materials sourcing to innovative product design and end-of-life strategies, we'll delve into the various facets of circularity and showcase real-world examples of companies leading the way in circular furniture production.

Whether you're a furniture manufacturer, designer, retailer, or consumer, this guide aims to provide you with the insights and strategies needed to embrace the circular economy and contribute to a more sustainable future for the furniture industry. The European Union is creating a legislative framework with a series of directives that must be known and complied with in the short and medium term. Therefore, it has also been considered necessary to dedicate a section to provide an overview of the complex legal context in a schematic manner.

Figure 2 Sustainable Development Goals (Resources. globalgoals.org)

4 status of the furniture sector

State of the art

The level of design and high quality offered by the European Furniture Industry is recognized worldwide and sets trends throughout the world, generating a turnover of more than 100 billion euros, of which 64 billion euros are from exports. Composed mainly of small and microenterprises, the sector has 120,000 organizations employing 1 million employees and combining the most modern industrial processes with traditional craftsmanship to respond to private consumers and public procurement, according to data published in 2024 by the European Furniture Industries Confederation (EFIC), one of the members of the FurnCIRCLE project and member of the European Commission's High-Level Forum on European Standardization.

To respond these demands, the sector requires a large quantity of materials and semi-finished products, some of them from third countries. This dependency, linked to a linear take-make-dispose model, fuels environmental issues on a global scale, with a direct impact on resource depletion, biodiversity loss, and climate change. The global extraction and processing of raw materials is responsible for 50% of greenhouse gas emissions worldwide and 80% of biodiversity loss (IRP, 2019).

Every year, 10 million tons of furniture are discarded, mostly inappropriately, in the European Union alone, representing over 4% of the total flow of urban solid waste. Overproduction is one of the main causes, resulting with the elimination of new products that could not be sold. According to a study by the European Furniture Industries Confederation, less than 10% of furniture waste in the urban solid waste stream is recycled, so it is normally incinerated or sent to landfills due to inadequate infrastructure and improper management.

Faced with this situation, the furniture sector is a dynamic industry with the necessary characteristics to respond and provide great improvements to the current priorities of the European Union, focused on a sustainable and circular economy.

Background

In recent decades, it has become evident that environmental protection is crucial for the system, neither hindering development nor implying exorbitant long-term costs. However, it wasn't until 1983 that the United Nations addressed these challenges head-on by establishing the World Commission on Environment and Development. With the publication of the report "Our Common Future" in 1987, it underscored the necessity of a balanced and sustainable global perspective to foster economic and social development while safeguarding the environment and the well-being of future generations.

As a result, since the 1990s, the international community adopted action plans to promote sustainable development within the framework of Agenda 21, creating a reference for most existing policies at regional, national, and international levels.

"Sustainable development is defined as meeting the needs of the present generation without compromising the ability of future generations to meet their own needs." *Report titled "Our Common Future" from 1987, World Commission on Environment and Development*

Another relevant global milestone is the approval of the Sustainable Development Goals (SDGs) established by the International Community in 2015 to address major challenges and achieve a better world by 2030, serving as a roadmap for organizations, companies, cities, and countries.

The European Commission adopted its First Circular Economy Action Plan the same year, where it specified a series of actions to initiate a transition towards the circular economy, changing the paradigm of the moment. Their commitment to environmental sustainability led them to adopt The New Circular Economy Action Plan (CEAP) in 2020 as a cornerstone of the European Green Deal (2019) for the transition towards sustainable growth without compromising natural resources, with the goal to reduce emissions by at least 55% by 2030 and achieve territorial climate neutrality by 2050, simultaneously stopping biodiversity loss. Figure 2 shows the 17 UN's Sustainable Development Goals.

New guidelines

To create a solid policy framework, in June 2024, Ecodesign for Sustainable Products Regulation (ESPR) or Regulation (EU) 2024/1781 has been adopted, building on the Ecodesign Directive 2009/125/EC, which previously only covered energy-related products. The new regulation additionally addressed the environmental impact of product groups throughout their life cycle, improving their efficiency and extending their lifespan, making it easier for consumers, companies and authorities to access information on the sustainability characteristics of products through a Digital Product Passport (DPP).

Digital Product Passport
A new electronic tool proposed in the ESPR to easily share quantitative and qualitative information related to the sustainability of products throughout their life cycle and to increase their traceability. Its transparency regarding the amount of recycled material, reparability, or durability, among other factors, aims to help public authorities optimize their control systems, as well as assist consumers and businesses in making decisions during the purchasing process and in future scenarios once the product has been obtained, such as what to do with the product at the end of its use.

At the beginning of 2023, the Commission held a public consultation on priority product categories based on the Joint Research Centre (JRC) report, which presented a series of candidates based on environmental impact, their relevance in the European market, potential for improvement, and possible efficiency in the use of resources and energy. Furniture* was one of these categories, due to their potential significant contribution to the waste generation issue and the considerable room for improvement in extending their useful life. A shift in perspective during the design stage, where durability (reliability, reparability, reusability, or upgradeability) and recyclability (possibility of recovering components, remanufacturing, or recycling) requirements are applied, can lead to positive impacts throughout the product life cycle.

On December 5th, 2023, the Commission welcomed the provisional agreement on more sustainable and circular products to replace the "Ecodesign Directive" 2009/125/EC, and finally, on the 28th of June, the ESPR - Ecodesign for Sustainable Products Regulation was published in the Official Journal of the European Union and entered into force on the 18th of July 2024 with Regulation (EU) 2024/1781, establishing a framework for setting ecodesign requirements for sustainable products, expected to be applied by manufacturers between 2027 and 2028. Figure 3 shows the timeline of milestones by international and European initiatives and regulations.

**Free-standing or built-in units whose primary function is to be used for the storage, placement or hanging of items and/or to provide surfaces where users can rest, sit, eat, study or work, whether for indoor or outdoor use. The scope extends to domestic furniture and contract furniture items for use in domestic or non-domestic environments. Bed frames, legs, bases and headboards are included in the scope. Not included are: bed mattresses, streetlights, railings and fences, ladders, clocks, playground equipment, stand-alone or wall-hung mirrors, electrical conduits, road bollards and building products such as steps, doors, windows, floor coverings and cladding.* *Joint Research Centre, Ecodesign for Sustainable Products Regulation - preliminary study on new product priorities, European Commission, 2023 (p. 136)*

Beyond energy efficiency, according to the European Commission (European Commission, Ecodesign for Sustainable Products Regulation. commission.europa.eu), the new ecodesign requirements promote circularity and cover the following aspects:

- Product durability, reusability, upgradability, and repairability.
- Presence of chemical substances inhibiting material reuse and recycling.
- Energy and resource efficiency.
- Recycled content.
- Carbon and environmental footprints.
- Available product information, particularly a Digital Product Passport.

The ESPR measures will apply to all products in the furniture sector, as well as others such as mattresses and ceramics marketed in the EU, even if they are produced outside of the EU. Some of these measures, like the Digital Product Passport, will be developed in collaboration with international partners to help eliminate trade barriers and reduce costs in sustainable investments, marketing, and compliance. Additionally, the European

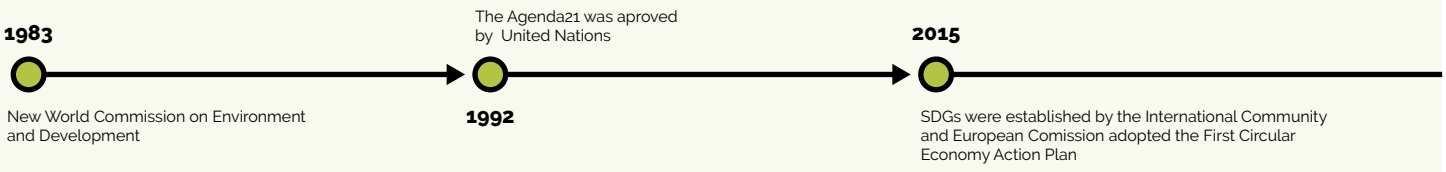


Figure 3 Timeline

Union will work alongside producing countries that share sustainability goals and will evaluate the repercussions on third countries.

To address the challenges and achieve the ambitions of the circular economy, the European Furniture Industries Confederation (EFIC), as the industry's representation in Brussels, supports a gradual, sustainable, and realistic transition towards circularity, taking into account economically sustainable criteria.

In addition to this regulation, the European Parliament has approved others, in line with the European Green Deal, such as the 2024/825 empowering consumers for the green transition directive, to tackle unfair commercial practices that mislead consumers and prevent them from making sustainable choices; the 2024/1799 Right to Repair Directive, which establishes minimum standards for the reparability of products sold in the European Union. The provisional final text version of the Packaging and Packaging Waste Regulation, which defines some practices to make packaging more sustainable. Or the directive 2023/1115 European Union Single Market which guarantees that the products Europeans consume do not contribute to deforestation or forests degradation worldwide.

The Commission also adopted targeted amendments to the EU Taxonomy Climate Delegated Act. It's a non-mandatory classification system that helps companies and investors identify "environmentally sustainable" economic activities to make sustainable investment decisions.

It is essential to recognize that several of these regulations are recent and have not yet established quantifiable benchmarks. Consequently, it is crucial to remain vigilant regarding any new developments that may emerge in the forthcoming months or years, as the European Union delineates the requirements of these new statutes through delegated acts.

Challenges

The current complex context may lead the European Furniture Industry to experience some uncertainty and occasional vulnerability, requiring to face a series of challenges in order to be able to progress and grow sustainably.

The most significant challenges, along with recommendations presented below and expressed by EFIC, proactive in identifying standardization priorities in support of EU policies and legislation. It considers standards as a key aspect for the proper functioning of the Single Market and a competitive and innovative European industry, as well as that implementation of the circular economy would help address many of the challenges directly or indirectly.

1 Amount of waste generation

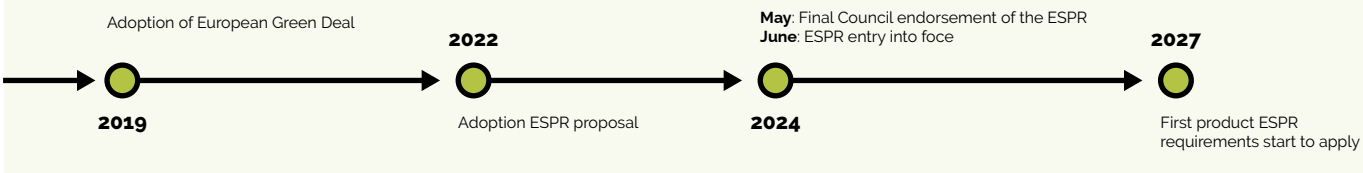
Currently, a huge amount of furniture is discarded and most of it ends up being incinerated, in landfills, or used for energy. Alongside new circularity measures, it will be necessary to strengthen the waste management system throughout the EU and mandate the cascade use of materials to ensure there is no diversion from material use to energy use.

2 Shortage of raw materials and increased prices

The scarcity of resources, problems in the supply of raw materials and the volatility of their prices, together with the low margins of manufacturing processes, force companies to seek alternatives to significantly reduce their costs. By implementing circularity measures in business models, opportunities for savings will arise, enhancing their resilience.

3 Import needs of materials and components

Dependence on certain materials forces imports from third countries, so different geopolitical contexts push companies into a vulnerable situation. To ensure the use of secondary raw materials, Europe will need to invest in infrastructure to have the necessary capacity to recycle and obtain quality recycled material at a competitive price.



4 Higher energy costs

Manufacturing products entails most of the energy consumption, especially if it involves plastics or metals, as well as wood panels due to the high pressure and temperatures required. In a period where energy costs are suffering from extremely high inflation, furniture producers can see their margins reduced. New policy measures can solve energy prices while reducing costs for the industry.

5 High complexity of repair

Transportation of heavy and big elements and labour costs generally make any furniture repairs expensive, and consequently, the cost-savings difference between new and old furniture is not significant enough to change the habits of many consumers. Economies of scale and economic incentives, along with easily detachable design and standard spare parts, could make furniture refurbishment more attractive and economically profitable.

6 Fast homeware trends

The emergence of micro-trends is promoting the commercialization of low-quality, cheap products with a short lifespan and little chance of repair and recycling. A new regulatory framework will provide conditions for the spread of environmental sustainability in products, gradually expanding responsible purchasing.

7 Consumer preferences

New emerging consumption models are needed, and there is a need to inform consumers about product specifications more thoroughly while developing servitization options. The new regulation will promote the extension of the useful life of products through the Digital Product Passport, which, in addition to providing information on environmental sustainability to support responsible purchasing, will include specifications regarding durability, repairability, or spare parts availability.

8 Low profits

The profits in modern manufacturing processes are often insufficient to achieve a clear advantage over the competition, although the integration of circular strategies into the production system can bring new opportunities and improve its efficiency.

9 Shortage of skilled workers and low attractiveness of industry among youngsters

To obtain successful products, it is essential to work with qualified personnel throughout all processes. Their high skills and abilities can bring creative solutions along the value chain and improve the company's competitiveness. Given the current labour shortage, collaboration among all actors will be required to identify needs and policy investments to support and improve vocational education.

10 Increased competition from third countries

Like other industries, the European Furniture Industry is suffering from strong competition from third countries, therefore it will be necessary that obligations and conditions are fair for all (level playing field), avoiding differences between European products, imported or second-hand.

11 Counterfeiting

Online sales have increased illegal practices, so it will be important to allocate more resources to stop product counterfeiting. Design, along with the high quality and innovation that characterizes European Furniture, is a key aspect of differentiation and particularly at trade fairs, thus it must be protected from possible infringements.

12 Regulations

There is an increasing demand from citizens for products with sustainability requirements. Hence, several member states have already begun to establish national standards, with the risk of complicating and increasing costs for companies. To achieve a competitive European industry, EU legislation will need to be harmonized, naturally expanding the market for environmentally friendly products.

Opportunities for the furniture sector

As said before, the Industrial Revolution promoted a linear system based on use and disposal, where the priority was focused on producing as much as possible. To this day, this model remains as the most common and is responsible for serious environmental problems such as climate change or biodiversity loss. Them, along with the complex global economic and social situation, have highlighted the need to move towards a resilient system capable of benefiting people, the environment, and businesses.

Some adjustments in business models and modifications in products, based on circularity, can even prove to be particularly profitable, resulting in global savings figures in the billions of euros. It all depends on the degree of implementation of the circular economy in industries, their own characteristics, and the market conditions at the time. Benefits can be achieved through different areas:

1 Cost savings

By promoting efficiency in the use and recovery of materials and components, the acquisition of virgin raw materials is reduced and it is possible that there will also be associated reductions in energy consumption or taxes.

2 Waste reduction

The circular economy seeks the most efficient use of resources, thereby minimizing the production of waste and consequently saving costs associated with waste management.

3 Operational efficiency

Thanks to technological developments and energy efficiency, innovation in processes and products is promoted, saving costs, and achieving differentiation from the competitors.

4 Stronger resilience

Companies' resilience to natural or geopolitical crises can be improved by reducing supply risks and price volatility through diversification of supplier sources and reducing dependence on virgin raw materials.

5 Improvement in product quality

Products designed under circularity criteria use durable materials with the potential for repair, promoting reuse and recycling at the end of their life cycle.

6 Easier access to demanding markets

With the application of circular design, products can be aligned with the values of environmentally conscious consumers and expand their market share, as well as more easily comply with local regulations.

7 Improvement of public opinion

The circular economy focuses on the complete life cycle of products, promoting data collection and transparent communication, which can identify areas for improvement and attract consumers during the purchasing process.

There are several internationally recognized environmental certifications that help identify products with a low environmental impact like the Life Cycle Assessment (ISO 14040, ISO 14044), Carbon Footprint (ISO 14067), Water Footprint (ISO 14046), Cradle to Cradle or Environmental Labels (ISO 14024, ISO 14021, ISO 14025).

5 circular economy

From the linear model to the circular one

The circular economy is a new model that seeks to improve resource efficiency and breaks away from the established dynamics, characterized by a linear model of production and consumption. The term gained relevance in 2010 thanks to the impetus of the Ellen MacArthur Foundation, as result of the founder's experience as a solo sailor five years earlier, when she sailed around the world.

Circular economy is a continuous-cycle economic system in which materials, components and products are kept in the value chain for as long as possible, reducing environmental impact and improving product production and consumption. From this innovative practice, the life cycle of products is extended and waste is minimized thanks to efficient management, avoiding air, soil and water pollution as a result of incineration or the use of landfills. In addition to decoupling economic activity from the consumption of finite resources, it defends the use of renewable energies and materials in a controlled manner, to preserve and enhance natural capital, and thus generate optimal conditions for the regeneration of nature.

The circular economy is inspired in some other sustainability models such as Sustainable Development, Biomimicry, Natural Capitalism, Regenerative Design and the "Cradle to Cradle" model.

1 Sustainable development

This theory, formalized in the well-known Brundtland Report of 1987, seeks development that meets the needs of the present without compromising the ability of future generations to meet their own needs, aiming for a balance between economic, social, and environmental aspects.

2 Biomimicry

Although theories about it had previously emerged, in 1997 Janine Benyus popularized the term in her book "Biomimicry: Innovation Inspired by Nature", where she presented nature's ability to solve problems that have arisen throughout the life of planet Earth, and how to imitate it in different fields to become more efficient and sustainable.

3 Natural capitalism

In 1999, the Americans Paul Hawken, Amory Lovins, and Hunter Lovins published the book "Natural Capitalism: Creating the Next Industrial Revolution," which described a new economic proposal linked to natural resources, leaving behind traditional industrial capitalism. Economic activities should seek new business models based on services and employ resources efficiently, considering the waste recirculation. Additionally, the change would also impact a new model of assets, not just monetary ones, in which environmental and social benefits would be accounted for.

4 Regenerative design

The concept of regenerative design emerged in the early eighties to describe agricultural practices aimed at repairing damaged ecosystems and improving them, creating suitable conditions based on nature's own behaviour. Natural systems have the power to regenerate for their survival and find balance. This principle of balance is what should be searched in other areas to develop resilient systems that meet society's needs while considering the integrity of nature.

5 "Cradle to Cradle" model

"Cradle to Cradle: Remaking the Way We Make Things" was a book published in 2002, where architect William McDonough and chemist Michael Braungart presented the regenerative power of design as an opportunity for overcoming and improving the system. Where every product can be disassembled to be returned to the soil as biological nutrients or recover and reuse its technical materials in new products through renewable energies.

The life cycle approach

To analyze a product from the environmental point of view, it must be understood from all phases of its life cycle, where all actions or activities are included. Each product has different needs that condition a relationship with the user, costs and a specific environmental burden related to the use of materials, energy and emissions. The five stages of the life cycle are explained below in an orderly manner: material resources, production, distribution, use phase and end of life. There is also an initial design stage which determines what happens in the whole life cycle, because is where most of the decisions will be done.

0 Design stage

The circular economy model requires a comprehensive and coordinated rethinking of products, services, business models and production processes. Design has a crucial role to play here, alongside other disciplines, highlighting the importance of this phase in anticipating future problems and devising solutions to address them.

Design is the point at which the life cycle of a product and its impact are most determined. A critical part of a product's environmental impact is determined at the design stage, so it's extremely important that these criteria are considered at this specific point in the project.

Circular design promotes the thoughtful selection of materials, prioritizing secondary materials with lower environmental impacts that also meet project requirements such as functionality, durability, and aesthetics. Furthermore, it encourages the adoption of production processes that are more energy-efficient and generate less waste. Additionally, it aims to optimize distribution and logistics by reducing weights, volumes, and transportation distances. By significantly extending product lifespans and enhancing their usability, maintenance, and repairability, circular design maximizes their overall impact. At the end of a product's life cycle, circular design supports the reuse of components, remanufacturing, recycling, or composting, unlocking substantial potential benefits.

To be coherent and achieve good results, the new design proposal must be conceived according to the company's business model and values. A clear subsequent communication about the project and the product, related to its use and maintenance, will help consumers, waste managers and repair facilities to interact with the product in the best possible way, improving the efficiency of these activities. With good communication the benefits of circular design can be better understood by all the agents of the value chain, improving the overall result of the process.

1 Material resources stage

This phase refers to all the materials that make up a product, from activities for their acquisition to the processing of raw materials and the energy used. These materials can have a natural origin: plant-based such as wood or linen; animal-based, such as leather or wool; or mineral-based, such as aluminium or marble. Additionally, there are artificial materials that require transformation, such as steel, glass, plastics, or ceramics. In the furniture sector, a wide variety of materials are used, although wood has always been predominant.

From the extraction process of these raw materials through physical or chemical treatments, associated aspects arise such as toxicity, energy consumption, soil degradation, water or soil contaminants, or gas emissions. Extracting wood from responsible forests (FSC / PEFC) helps to maintain and regenerate forests.

In a circular system, various strategies can be employed to reduce the impact in this stage. They can be related to composition, such as the use of recycled material, the use of renewable resources, the simplification of the material choices developing single-material products; to weight reduction, for subsequent transport or production optimization; or related to the source, such as the use of local and renewable options. To promote and verify sustainable materials, there are certified labels for identification, audited by specialised external organizations.

2 Production stage

This phase includes all the activities necessary to convert raw materials into a product. Most of these activities require energy and probably lead to waste generation. Therefore, it is crucial to have a defined stocking policy based on a well-founded sales forecast to avoid overstocking the consequent disposal problems.

To minimize the impact, the most efficient production processes have to be considered, and creativity and innovation can achieve improved results. Although it may be seen as an expense at first, an assessment must be made at the strategy level for long-term benefits. With the recovery of production waste through a closed loop, for example, waste is returned to circulation within the value chain.

Another aspect that improves the competitiveness of companies and reduces emissions is the efficient and autonomous use of energy, promoting renewable energies as an alternative to fossil fuels, such as solar or biomass.

3 Distribution stage

Once the product is manufactured, it is packaged for subsequent distribution via land, sea, or air until it reaches the hands of the consumer. In this stage, environmental aspects are studied based on the mode of transportation, travel distance, and the number of transported items, which may be more or less optimised depending on the volume or weight of the package. It also includes the movement of materials or energy between different operations in any of the other stages of the life cycle.

It is essential to consider distribution within a product's life cycle, as there can be hundreds of kilometres of distance between the manufacturing facilities, often being more than one, passing through a distributor or warehouse before reaching the final consumer. Trans-

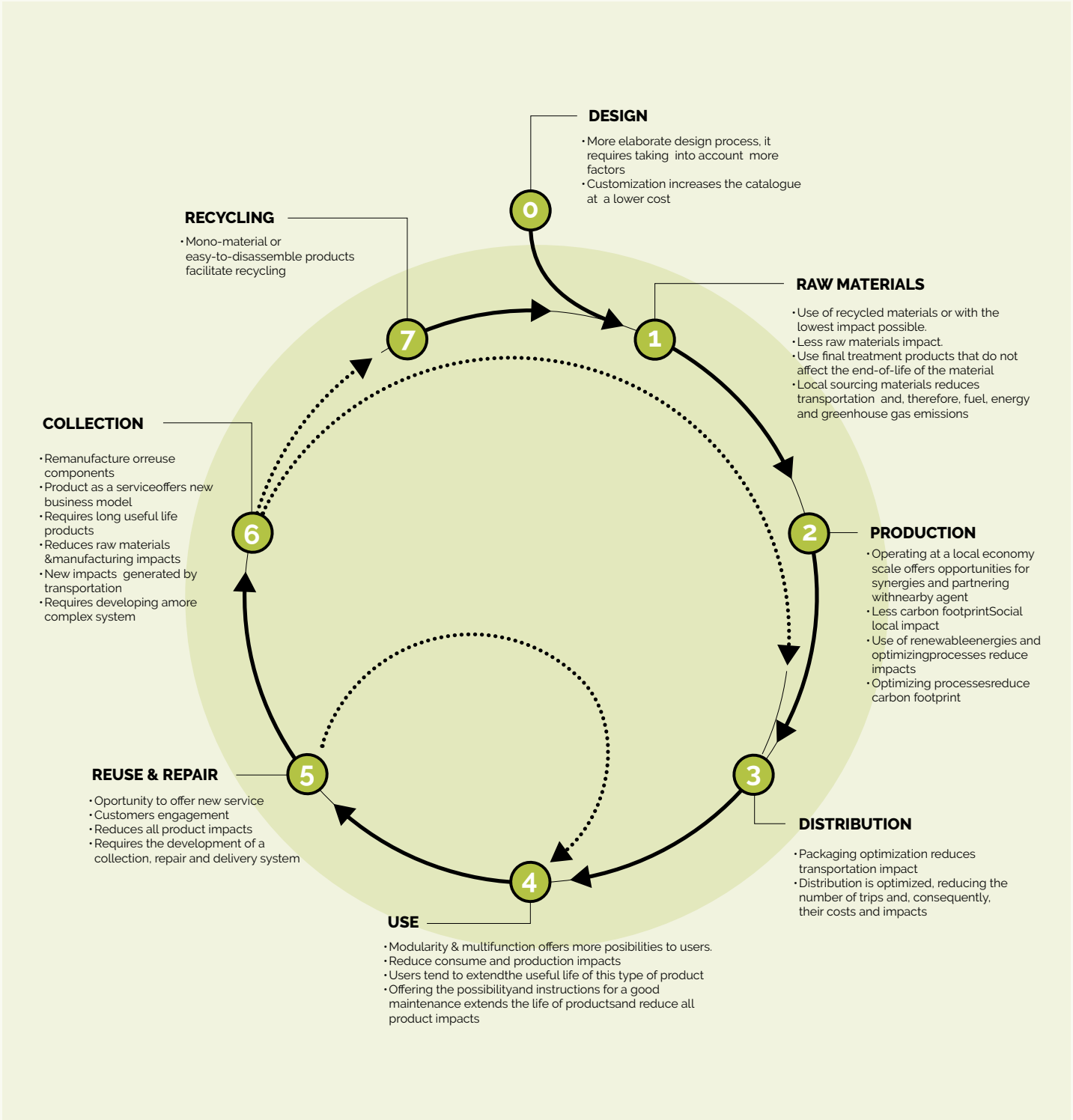


Figure 4 Linear vs circular model system

portation is one of the main contributors to atmospheric pollution and fossil resource extraction.

Packaging must also be taken into account in this phase. Circular design criteria are also applicable to it, seeking reduction, composition from recycled materials, recyclability afterward, or even better, designed for reuse if feasible.

The rise in online sales has expanded reach for consumers, manufacturers, and both large and small distributors. However, it also presents challenges to the circular economy when impulse buying increases, local stores are bypassed, immediate shipping is demanded, or return services are routinely utilized. These practices generate unnecessary transportation and produce tons of packaging waste.

4 Usage stage

During use and maintenance, there may be a determined energy consumption and associated resources if the product requires it for its operation. Considering that most current energy sources are non-renewable, this can become one of the main environmental problems in some sectors.

A durable design along with good usability and maintenance practices, can substantially reduce the impact with longer lifespans, avoiding the need of producing new products as the actual ones work for longer periods. To obtain lower energy consumption and resource usage such as water or oils, or other substances is also essential to reduce the impacts in this stage.

The lifetime of a product is also determined by the user's perception of its function, ergonomics, and aesthetics. So, as we said before, it is important to work in terms of anti-obsolescence in the initial design phase.

5 End-of-life stage

The end-of-life stage of a product can be very diverse depending on the type of product, its composition and design, and the infrastructure for material recovery or recycling. Waste disposal should always be the last option because the opportunity to revalue is lost, and the product will often end up being incinerated or dumped in landfills where it can cause harmful effects on the environment and human health.

The controlled disposal of waste can generate energy, converting it into electricity. While incineration generates heat, landfill gas and gas from the decomposition of organic waste can be captured. Through the degradation of compostable materials, a nutrient-filled substance can also be obtained to enrich the soil.

There are currently circular proposals from manufacturers that apply a "take-back" production and consumption model, to extend the life of the product, components, or materials through intervention for reuse, remanufacturing, and recycling.

Environmental, social, and economic benefits

From the 18th century to the present, various industrial revolutions have shaped the way we produce and consume, transforming society and influencing current economic development. The steam engine before, and the expansion of electricity decades later marked a period of extraordinary progress. In recent decades, the adoption of data management technologies and the computational capabilities offered have also transformed the world radically, leading to the current Industry 4.0 scenario, where it is possible to interconnect processes, products, and services through digital technologies. According to the Eurobarometer report published in July 2023, a majority of European people (66%) consider that technologies will play an important role in fighting climate change.

Emerging technologies such as Big Data, blockchain, the Internet of Things (IoT), and Artificial Intelligence (AI) are becoming fundamental support tools for new business models arising within the framework of the circular economy. In addition to achieving optimized production, surpassing the quality of resulting products and reducing costs, these technologies allow for a level of flexibility capable of effectively responding to the specific needs of each case. Through the collection and exchange of information, organizations achieve greater reliability, enabling them to make better decisions, be more innovative, and communicate transparently.

While the foundations of the circular economy are rooted in environmental principles, as the term implies, its focus extends to revolutionizing the conventional production and consumption models. It seeks to safeguard economic interests by fostering smart development practices that mitigate adverse impacts on both human health and the planet.

Its benefits have a direct impact on the social, environmental and economic areas, becoming the key to achieving sustainable development goal number 12 "Responsible Consumption and Production" among others of the 17 SDGs set by the international community in the 2030 Agenda for Sustainable Development. However, it has the potential to positively intervene in other spheres as well, as it promotes interconnectedness across different aspects.

In **the environmental dimension**, a circular model promotes the elimination of pollution and waste, regenerating natural ecosystems. To achieve this, products need to be designed with specific criteria for reducing impact, and their production should be based on energy efficiency using renewable resources.

In **the social dimension**, the circular economy provides opportunities for quality job creation in different areas related to new circular business models, from design and consulting services, to shared use projects or material recovery. It seeks the well-being of a society looking for a fair society.

In **the economic dimension**, the new model seeks sustainable growth through innovative proposals and implies a conscious and responsible way of consuming from the market, which prefers local and quality products, being able to replace imports, while increasing resilience and generating cost savings associated with material or energy resources.

Figure 5 Impacts of a circular approach related to the SDGs

A continuous flow concept

In a linear system of extract-produce-consume-dispose, most waste ends up in landfills or is incinerated, which is an unsustainable practice considering that the resources the earth offers are finite. Additionally, this practice poses human health and environmental problems. To achieve a balanced situation, it is important to optimize resource use by maximizing the recirculation of products, components, and materials in both technical and biological cycles, promoting a regenerative system that allows nature to thrive. The Ellen MacArthur Foundation proposed the Butterfly Diagram to explain this concept of continuous flow, based on the aforementioned three pillars of the circular economy: **waste and pollution elimination, product and material circulation and nature regeneration**.

On the left side of the Figure 6 appears the **biological cycle**, intended for biodegradable materials, that grow and are consumed, returning to the soil and regenerating it without causing damage. It describes processes that provide nutrients and help the nature regeneration. Although it mainly refers to substances that are consumed such as food, other biodegradable materials like wood may shift to this cycle when they reach a degrade point where manufacturing new products is not feasible.

Nutrients in organic waste streams can be recovered and returned to the soil through composting, involving oxygen, or anaerobic digestion. Regenerative management of biological resource sources such as forestry, agriculture, livestock, or fisheries allows for healthy ecosystems and increased carbon storage in the soil, enhancing air and water quality. Additionally, microbial decomposition processes produce biogas, which can be utilized as an energy source.

Loops or cascades within the biological cycle allow the creation of new products, consumable or not, using ingredients considered waste and cascades are also a storage of CO2 in wood as long as it does not decompose. Here again wood is a good reference, as cascading achieves sequential and multiple uses of wood materials, from high-value products to recy-

cling and finally energy recovery, with intermediate stages where subproducts and wood derivatives are obtained, maximizing recirculation and minimizing waste. From biomass, post-harvest and post-consumer organic materials, fuels, energy or high-value chemicals can also be obtained.

In **the technical cycle**, on the right side, finite materials such as metals or polymers are designed to flow in closed-loop industrial cycles while maintaining their quality and value. Products, components and materials circulate through sharing, repair, reuse, remanufacturing, or recycling. Each of these processes occurs in a differently sized loop, as smaller ones retain more value than larger ones and are considered priorities. Recycling, the most external, completely loses value as a product, being reduced only to the value of the material itself as it is at the end of its life cycle.

To achieve greater success, companies should design their products considering processes aligned with their business model strategy. The more durable a product is, the better it withstands shared use; or the simpler the separation of its parts, the easier recycling becomes. Nevertheless, it is important to consider the various loops and prioritise the ones that keep value as much as possible.

The circular economy offers new opportunities through various potential value-creating strategies, representing cost savings for both users and companies.

"The power of the inner circle"
Keeping products in the inner circles entails fewer changes when they are reused, transformed or remanufactured.

"The power of circulating longer"
Increasing the number of cycles and the period of each one maintains the value of the materials, products and components

"The power of cascading"
Using materials in a cascade, diversifies their reuse across different sectors before being devalued

"The power of pure inputs"
Circulating in flows of uncontaminated materials preserves the quality, particularly of the technical elements.

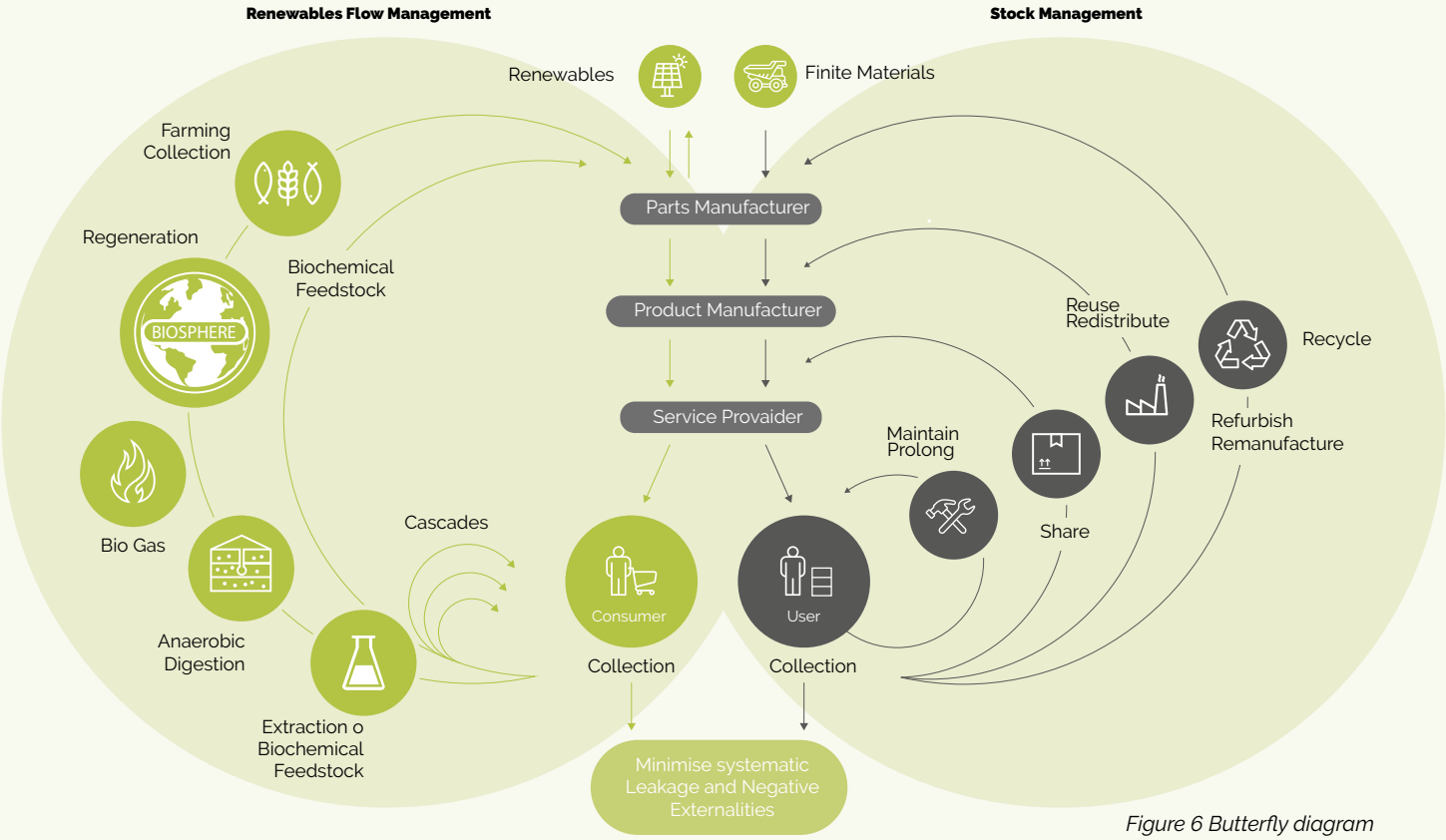


Figure 6 Butterfly diagram
Own version

Innovative business models

A business model is characterized by what the organization offers to the market and its way of attracting customers. It is in this relationship between company and client where value is created and delivered by covering needs, in exchange for capturing value in the form of profits.

Innovative circular economy theories for business models are reflected in the strategic framework of The Value Hill (Achterberg et al. 2016), providing companies with a visual resource to understand the state of their business in the pre-use, use and post-use stages, and reflecting on consumption modes through key points, in order to keep resources in the value chain for as long as possible. Companies in the furniture sector are traditionally conservative in their business models, making it necessary to introduce dynamism and innovations. The ISO 59000 series (ISO 59004, 59010, 59020, 59040, 59014, 59031, 59032), not all of them finished yet, offers guidelines for deploying circular economy and adoptingcircular business models.

In the uphill phase, value is added step by step through extraction, production, and distribution activities, reaching the peak, representing the usage stage. Although differences between the two systems can already be identified throughout this process, such as the exploitation of finite vs renewable resources, or short vs maximum lifetime, for example. It is on the downhill path, when the product has reached the end of its utility, that the benefits of a linear economy clearly differ from those of a circular economy, where resources are conceived with an intrinsic value beyond their economic connotations. As shown in the first graphical representation, in a traditional system this value is destroyed, whereas in the second, the process is slowed down thanks to the application of circular strategies, allowing products, components, and materials to ascend directly to the peak, or to be placed again to an uphill stage to return the usage phase, repeating the process.

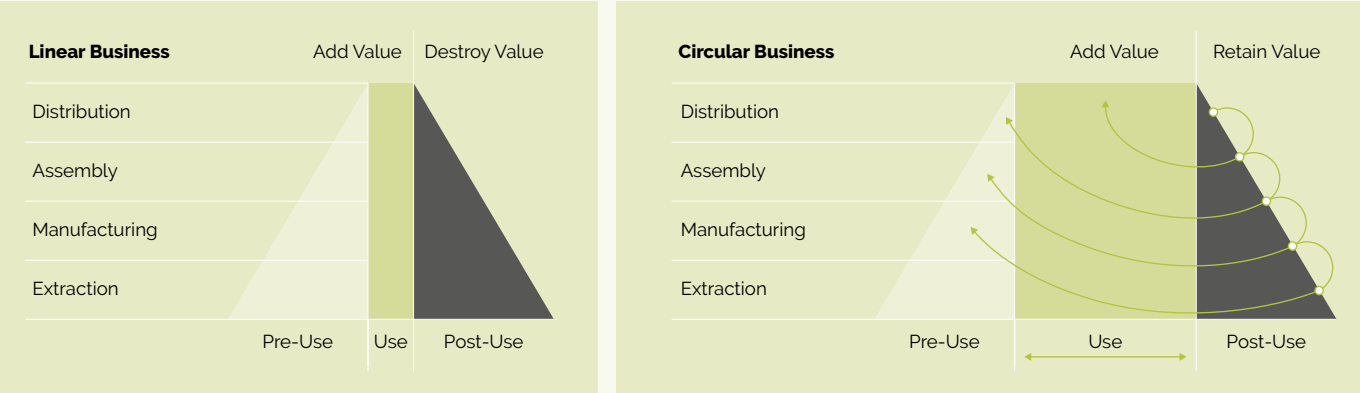


Figure 7 The Value Hill in a linear business vs circular

The 10 ways of retaining value presented are commonly known as the R Ladder: refuse, rethink, reduce, reuse, repair, refurbish, remanufacture, repurpose, recycle, and recover. All strategy concepts begin with RE, reinforcing the essence of the circular economy, and are categorized according to stages and extension of loops. The earlier they occur, the shorter they are and the greater impact they have, thus considered more sustainable. In any case, a main circular strategy is usually determined together with secondary ones that can provide support.

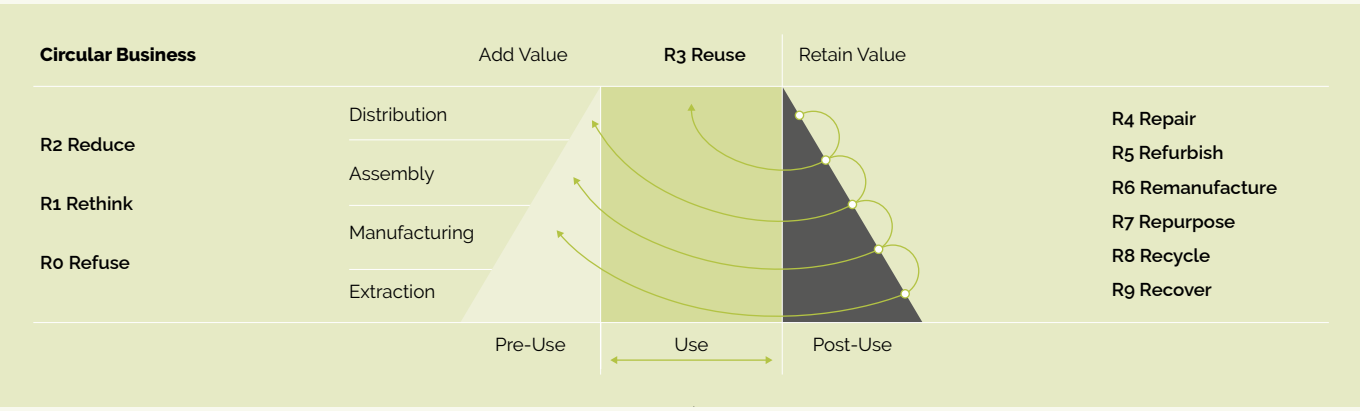


Figure 8 Circular Strategies applied to business in The Value Hill.

Short Loop Stage (R0, R1, and R2)

By considering the minimization of elements during the design and manufacturing processes, a more intelligent use of resources is achieved, preserving value.

R0 Refuse
Emerges as a response to the extract-produce-use-dispose system, based on the abusive use of resources to manufacture cheap products with short lifespans. Senseless products, planned obsolescence, or materials harmful to health and the environment are rejected.

R1 Rethink
Proposals that intensify usage are valued. Through multifunctional products and exchange services, the impact on production and the need for raw materials are drastically reduced.

R2 Reduce
This stage focuses on waste and pollution reduction by increasing manufacturing efficiency, reducing material usage and energy resources, while maintaining product quality and proper use. It also recognizes both the application of mono-materials and the use of recycled materials.

Medium-Long Loop Stage (R3, R4, R5, R6, and R7)

Strategies focused on production and use improved product utilization, extending its lifespan while slowing down the loop.

R3 Reuse
A product may be discarded but still be in good condition to fulfill the same function for which it was designed for. A business model focused on the second-hand market is able to capture the interest of new users and expand usage opportunities.

R4 Repair
It is the manufacturer's responsibility to prepare its products for maintenance and possible repairs to ensure proper functioning, informing the user how to proceed if necessary.

R5 Refurbish
Updating products through processes or new components extends their lifespan, benefiting both, users by avoiding the investment for a new purchase, and the environment.

R6 Remanufacture
When a product is no longer usable, it is possible to salvage components in good condition to integrate them into new products and continue fulfilling the same function.

R7 Repurpose
Incorporating materials or components into different products yields the benefit of new utility, promoting creativity and innovative results with added value.

Long Loop Stage (R7, R8, and R9)

This stage is related to the end of the cycle and the use of waste as resources to be reintroduced back into the value chain.

R8 Recycle
Material recovery processes make sense when products can no longer be used. Transformation can result in materials of high or low quality depending on their condition and nature.

R9 Recover
Once a product reaches the end of its life, it is a critical moment to return materials and energy in the cycle. Through the decomposition process of organic waste, compost can be obtained to enrich the soil and produce biogas, which, like incineration through heat or landfill gas capture, can generate electricity.

There are also some other specific solutions for the furniture sector. According to the Joint Research Centre's primary ESPR report, **our sector has an enormous potential for circular improvement in material efficiency and product lifetime extension, being these the two main improvement strategies**. It is necessary to increase durability with quality materials and provide designs for reuse, repair, disassembly/reassembly, remanufacturing, and recycling so that materials and components can be reintroduced into the value chain.

The standard "EN 17902 Furniture - Circularity - Evaluation method for dis/re-assembly capability", prepared by Technical Committee CEN/TC 207 Furniture, provides guidance to maximize the disassembly and reassembly capability of furniture, to improve durability, reparability and recyclability.

"The durability of products can dramatically influence the environmental impacts of furniture products. Some estimates show that a one-year extension of the lifespan of office desks and tables from 15 to 16 years could save 65,000 tonnes of CO2eq each year, which would be equivalent to burning more than 60 million litres of diesel fuel." JJoint Research Centre, Ecodesign for Sustainable Products Regulation - preliminary study on new product priorities, European Commission, 2023 (p. 143)".

6 circular design

"Prevent rather than heal"

The design phase has the power to determine up to 80% of a product's environmental impact throughout its life cycle, minimizing waste, pollution, resource usage, and biodiversity loss. For this reason, to achieve a circular economy alongside a stable and sustainable situation, it is important to understand design from an evolved perspective from the concept of design inherent in a linear economic model.

The following Figure 9 shows, on one hand, the enormous potential of the design phase to prevent impacts compared to the rest of the phases in a product's life cycle, and on the other hand, how inefficient is to try to make improvements in the elimination stage, when most of the impacts have already happened and they are more difficult to solve. The comparison between these two concepts highlights the importance of initially applying circular strategies.

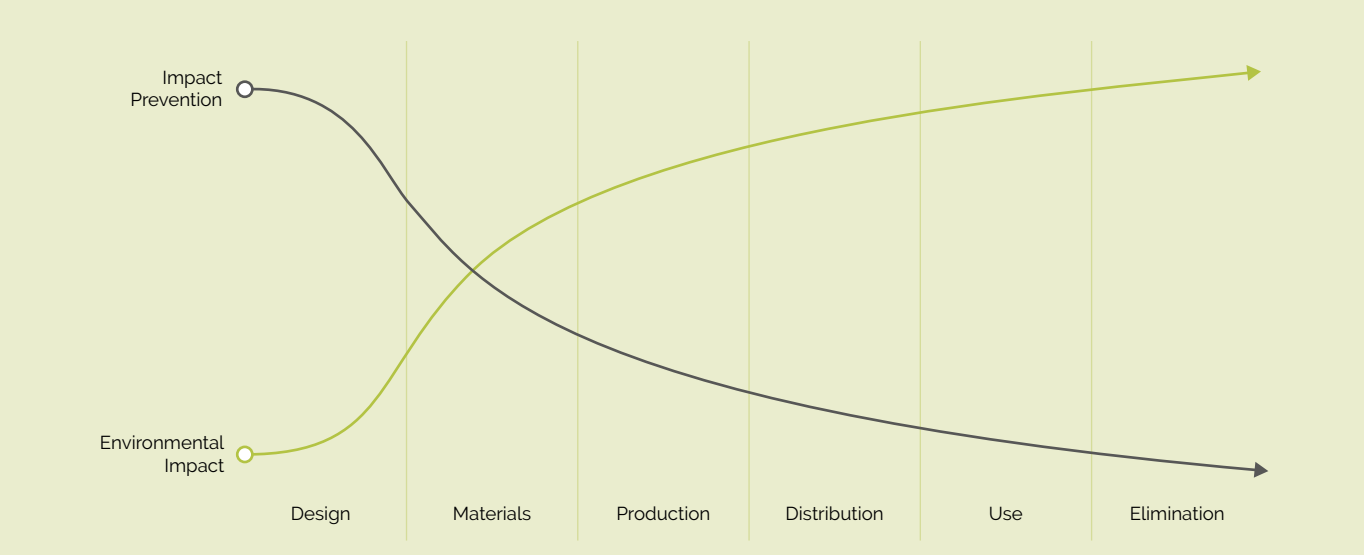


Figure 9 Design stage potential

For years, design practiced within a traditional linear system has fulfilled its mission of making products attractive for mass production and sale, promoting consumerism among the population and consequently, the overuse of resources and negative effects on the environment. Considering the enormous amount of goods that have ended up in the trash, the balance is a huge economic and natural capital loss.

"Ecodesign" was a term that emerged in the nineties within this entrenched linear system. It aimed to reduce the environmental impacts of products at all stages of the life cycle through material and process improvements, although without fully applying circularity.

Currently, the new directives of the European Union are committed to the real change towards an economy that is both efficient and respectful and therefore pursue an evolution in the way of understanding products at all stages, where value is maintained and recovered in biological and technical circles, supporting new service models and circular business models.

Thanks to systemic thinking applied in circular design, significant overall improvement changes can be achieved by eliminating, circulating, and regenerating. These are the three principles applied in the CE.

Eliminate
Design is capable of avoiding waste and pollution from the beginning by choosing optimal materials and applying them in the best way to minimize impact.

Circulate
Through design intended to be easily disassembled, repairability, updating, or recycling among others, are encouraged, for the extension of maximum use of the product and its parts.

Regenerate
Designing with consideration for improving biodiversity and the quality of soil, water, and air, with the application of biological materials that can be returned to the earth and enrich it.

Taking this into account, circular design could be defined as the key discipline to achieve a change in the economic model towards one focused on resource

circularity and energy efficiency, from a regenerative perspective of natural capital. Applying it properly in the initial stages of design and development of products, it impacts positively the rest of the stages, being capable of maintaining and recovering the value of the products, materials and components repeatedly.

In the same way that the benefits of the circular economy can be observed from the environmental, social and economic areas, circular design takes the same approach, maximizing efficiency in the use of resources to reach the elimination of waste. Therefore, through this, it minimizes pollution to contribute to the regeneration of ecosystems, with a direct impact on improving people's living conditions, while simultaneously creating new business opportunities with a clear path of sustainable economic growth.

Environmental dimension

- By incorporating strategies in the design phase, the impact of products on the environment is reduced, such as the effects derived from greenhouse gas emissions, the accumulation of waste on the ground or water pollution.
- Thanks to resource optimization and the extension of the lifespan of products or components, depletion is mitigated, decreasing material extraction and the energy needed to start manufacturing from scratch.
- Once again, the application of circular actions in the various stages of a product's life cycle aims at waste elimination, avoiding incineration and landfill proliferation.
- Through a conscious selection of materials, it is possible to mitigate biodiversity loss and ensure the conservation of ecosystems.

Social Dimension

- New business models drive the creation of new high added value jobs in different industrial sectors related to servitization, repair, remanufacturing, or recycling.
- Conscious and responsible consumption is promoted, where the work of individuals involved in production and distribution processes is valued, with decent working conditions guaranteed.
- Cleaner and healthier environments improve quality of life, encouraging people to adopt a more sustainable lifestyle and even driving cultural change.
- Thanks to new consumption models such as reuse or sharing, products become more accessible to people with fewer economic resources.

Economic Dimension:

- Following a methodology based on efficient resources usage, companies can reduce raw material costs and waste management expenses.
- New business models stimulate innovation as a business methodology and competitiveness in the market, as well as a culture of interdisciplinary work.
- Higher-quality products enable penetration into more environmentally demanding markets.
- Greater control over raw material supply chains minimizes dependence on scarce resources, reducing companies' exposure to price volatility and lack of availability.
- By generating high-quality recycling processes, we can facilitate the procurement of raw materials on a local scale, reducing dependence on other countries and regions and achieving a more self-sufficient economy.

The lack of knowledge of these benefits, along with a lack of environmental sensitivity, may act as a barrier to circular entrepreneurship for companies, causing them presence loss in the market sooner or later. The new directives and actions taken by the European Union in recent years aim to guide forward and serve as an impetus for success, as this is valued by the EU as the most effective way to address environmental challenges.

Analysis of the implementation

Currently, most companies are in the initial stages of training for the transition to a new system aimed at achieving competitiveness through sustainable management. To begin applying circular design, it is essential to have a broad vision of the long-term context in which you are working. This enables the detection of opportunities for value creation and identification of economic, social, or environmental impacts. It also allows for the evaluation of these effects and the proposal of improvement strategies. Continuous evaluation over time, after implementation, is crucial for studying new situations and generating proposals. This evaluation often needs to be conducted both internally and externally through user surveys.

Previously, it is crucial to have a team prepared to face the new challenges involved in the circular economy. In addition to understanding the company, they must be aware of existing environmental issues, of the new policies and regulations and be able to evaluate and implement new strategies. Whether they are large or small organizations, all employees must know the objectives and work in a multidisciplinary way to achieve successful changes. Depending on the structure and level of training, outsourcing services through a specialized partner to establish a clear roadmap is recommended. In the case of already having developed an environmental management system, following the ISO 14001 or the EMAS, it will be convenient to integrate ecodesign requirements (ISO 14006).

ISO 14001

ISO 14001 is an international standard for environmental management systems, widely adopted across Europe to enhance organizations' environmental performance. Recognized in all EU countries, ISO 14001 provides a framework for identifying, managing, and reducing the

environmental impacts of business activities, promoting sustainability. Companies certified with ISO 14001 demonstrate their commitment to complying with European environmental regulations, also gaining improved reputation and potential competitive advantages. The adoption of the standard further supports the European Union's goals for a circular economy and sustainable development.

EMAS system

The EMAS system (Eco-Management and Audit Scheme) is a voluntary tool developed by the European Union for the continuous evaluation, management, and improvement of environmental performance of all types of organizations, whether public or private, regardless of their activity. It promotes environmental character through a series of actions with subsequent benefits for entrepreneurial companies:

- Implementation of environmental management systems, ensuring legal compliance and facilitating the obtention of grants, permits, or licenses. As well as minimizing sanctions for infringements and reducing insurance premiums in conditions of environmental risk.
- Continuous improvement and creation of new business opportunities, thanks to an objective evaluation of the operation of management systems, controlling the reduction of resources, processes, or waste generation, with subsequent cost savings associated.
- Transparent dissemination of information on environmental performance, validated by accredited external auditors, improving brand image and encouraging other companies to collaborate in environmental improvement efforts.
- Involvement of the company's team and ongoing training to acquire knowledge and sensitivities in environmental aspects, motivating them to face common challenges.

Analysis	
Stage 1	Awareness and training of the team
Stage 2	Product Selection
Stage 3	Long-term context analysis
Conceptualization	
Stage 4	Identification of problems and evaluation of their effects
Stage 5	Opportunities identification and ideas generation
Stage 6	Concept selection
Implementation	
Stage 7	Product design development
Stage 8	Production
Stage 9	Market launch
Stage 10	Evaluation and detection of improvements

Figure 10 Implementation stages

The implementation of circular design could be summarized in 9 stages, adding the awareness and training of the human team as a necessary prior process to be able to move forward. It should be noted that each project has specific needs that could vary the proposed methodology. There are different tools applicable in each phase to facilitate the studies and their communication, alongside the following descriptions, some of these tools are mentioned.

Awareness and training of the human team

To work towards the new direction of circularity, it's important that all employees of the company understand the complex current context and the concept of the circular economy as a means to achieve global improvement. The sense of involvement and collaborative work across different areas will be crucial to explore new solutions aligned towards a shared goal and evolve their implementation.

Prior to this, it is necessary for senior management to be able to identify the various reasons for initiating the transformation and unify criteria to use as a guide in company's discourse and future decision-making. It's understood that motivations can arise from internal reasons, such as promoting environmental responsibility alongside brand image improvement or process efficiency, or from external reasons, such as responding to new market trends, advancements by competitors, or current legislative conditions.

The team that will lead the product development project must be carefully selected considering their environmental commitment and a set of competencies, in addition to a deep understanding of the organization itself. The decision-making capacity of the members, their team-working ability, their proactive attitude, and forward-thinking vision should be accompanied by systemic thinking that allows them to establish connections to address complex problems through strategies.

Analysis stage

The work team will be responsible for determining the product or products to work on, keeping in mind alignment with the company's motivations, assessing the potential for improvement in terms of minimizing negative impacts, and the margin for process optimization. The analysis can be done to improve products already marketed in the traditional linear system, or to consider the development of a new product incorporating, from the beginning, a circular perspective.

To begin the redesign or conceptualization of a new product, it is advisable to study its interaction context to obtain conclusions that will serve as a starting point for exploring improvement options, proposing different scenarios, and as supporting content for future decision-making. This includes analysing the sector, its legal framework, and various consumption trends, reaching the target market. Also, taking to account existing solutions such as services or technologies, among others, whether within or outside the company.

Next, an environmental assessment of the product will be necessary to determine the associated impacts along the whole life cycle that the product in question has or may have, in order to identifying areas for improvement and evaluating their possible effects. Once the main

impacts have been identified, it is important to objectively weigh them to determine which ones should be prioritized for resolution.

As this is a key point, the "Environmental impact assessment" section of this document is dedicated to explain the most common tools used to analyse, identify, or quantify aspects associated with the life cycle of a product.

Main applicable tools:

- Canvas model
- Environmental impact assessments

Conceptualization stage

Once the issues have been identified, a brainstorming session is conducted among the team members to generate ideas and develop creative solutions based on the opportunities identified within and outside the company. For this reason, it is important to design from a holistic perspective, integrating concepts directly or indirectly related to the product: manufacturing processes, consumer role, organization's business model, associated services, etc.

From the ideas generated in this process, several product concepts are developed for future development. Then, the selected proposals are compared to be evaluated from all aspects: technical, functional, aesthetic, economic, social, and environmental, determining the degree of compliance with the requirements and assigning an order of importance.

Based on the conclusions of this exercise, the product design is developed through techniques that designers deem appropriate in each case: sketches, renders, models, simulators, etc. It is in this phase that circular strategies are incorporated, a concept developed in the "Innovative business models" and "Circular design strategies and good practices" sections, to ensure that the final product meets the set expectations, aligns with the company's business model, and is able to retain value.

Main applicable tools:

- Circular design strategies
- Brainstorming

Implementation stage

This stage aims to manufacture the final design concept or redesign in order to introduce the desired products to the market. To achieve this, all areas of the company will be involved at different times and tasks to complete all steps: preparation of technical documentation, purchase of materials, production, quality testing, and cost analysis among others.

Prior to implementation, it is crucial to establish a short-, medium-, and long-term action plan to effectively manage the project's development, integrating environmental improvement measures. This plan should include monitoring the experiences of all stakeholders to reflect on and analyze the entire process, identifying opportunities for improvement and valuable insights to integrate into future productions or other projects.

All the data collected in the exercise are highly valued as marketing content to communicate in a transparent and quantifiable way the product impacts, supporting the company's vision and mission.

Main applicable tools:

- Project brief
- Gantt chart

Figure 11 Optimal framework for the circular design implementation

7 environmental impact assessment

Given the current context, an increasing number of companies is opting for the application of environmental impact assessment methods to identify and evaluate the effects of their activities associated with their products on the environment. This process assists experts and decision-makers in understanding products from a different perspective and establishing new improvement guidelines regarding material selection, production processes, recyclability, among others. Data collection is conducted for each stage of its life cycle, from conception and manufacturing to distribution and waste treatment, allowing for a comprehensive view of the product and the creation of an action plan aimed at minimizing impacts.

The environmental effects of activities associated with products during their life cycle vary depending on the sector and can cause a more or less considerable degree of negative impact depending on each case. The following categories were selected by the Joint Research Centre to define the ESPR proposal, addressing the main climate, environmental, and energy objectives of the EU with high, medium, or low relevance. "(Joint Research Centre, Ecodesign for Sustainable Products Regulation - preliminary study on new product priorities, European Commission, 2023 (pp. 136-144))".

Waste generation & management

Environmental impact: Medium

"In EU Member States each year, 10 million tonnes of furniture are discarded, the majority of which is inadequately disposed of. One of the main problems with this high number, is the elimination of new furniture that is not sold, indicating significant overproduction. According to the European Federation of Furniture incinerated or sent to landfill, with less than 10% recycled.

Underinvestment in reuse, repair and remanufacturing infrastructure limits the potential for furniture being managed in accordance with the principles of the waste hierarchy or the circular economy. Furniture waste in the EU accounts for more than 4% of the total municipal solid waste stream. Additionally, household furniture alone represents between 2% and 5% of municipal solid waste in the EU-28.

Impacts at the end of life vary considerably depending on what materials are used in the furniture. Recycling of furniture components or recovering energy from furniture waste is often complicated due to difficulties in separating components."

Improvement potential: High

"The improvement potential of the furniture sector lies in reducing waste generation. Eradicating, for example, the problem of overproduction, (...) designing for longer lifetimes, more durable components or ease of maintenance would imply lower long-term lifetime costs. Design for disassembly and repair is also important." (...)

Biodiversity effects

Environmental impact: Medium

"The effect on biodiversity for furniture is strictly related to the use of forestry products (wood, rattan, bamboo), because an unsustainable production of these specific materials negatively affect biodiversity. Currently, the majority of the furniture market does not assure that forestry materials come from forests sustainably managed."

Improvement potential: Medium

"The improvement potential of the furniture sector lies in sourcing of legal and sustainable source timber for furniture production. In addition to that the design for disassembly and repair, re-use and recycle would lead to an increase of the lifespan and a decrease of the need of virgin materials and the biodiversity impacts associated to the extraction."

Climate change

Environmental impact: Medium

"In a net-zero energy building, the impact of furniture represents about 10% of impacts on global warming. In particular, the material selection can play an important role in mitigating climate change. In the framework of the Paris Agreement, the furniture sector can contribute to the goal of limiting the global warming to 2 C by 2050. In the case, for example, of sales of office chairs and desks in the EU, they are associated with greenhouse gas emissions of more than 2 Mt CO_2 eq per year. According to studies, it is possible to improve the carbon footprint by up to 10% by increasing, for example, the proportion of recycled metals."

Improvement potential: Medium

"The improvement potential of the furniture sector lies in sourcing of legal timber for furniture production; using used materials instead of virgin material to decrease the impact on Climate Change. Wood materials from sustainable harvesting practices, present a significant opportunity for emission reduction. In addition to that

the design for disassembly and repair, re-use and recycle would lead to an increase of the lifespan and a decrease of the need of virgin materials." (...)

Human toxicity

Environmental impact: Medium

"The production and use phase of the furniture expose humans to several harmful substances like biocidal products, flame retardants, adhesives, resins, paints/varnishes/inks/dyes, plasticizers and foaming agents."

Improvement potential: Low

"The improvement potential of the furniture sector lies in addressing the composition of furniture elements, reducing the addition of harmful substances, using low emission materials and low VOC emission furniture." (...)

Soil effects

Environmental impact: Medium

"The main effects of furniture life-cycle on the soil is strictly related to the sourcing of raw materials like forestry products (wood, wood-based, rattan, bamboo), plastic and metals. Especially the forestry products have a direct impact on soil, land use change, and soil degradation, which are related to their management."

Improvement potential: Medium

"The improvement potential of the furniture sector lies in sourcing of legal timber for furniture production. In addition to that the design for disassembly and repair, re-use and recycle would lead to an increase of the lifespan and a decrease of the need of virgin materials and the soil impacts associated to the extraction." (...)

Air effects

Environmental impact: Medium

"Furniture contain substances like biocidal products, flame retardants, adhesives, resins, paints, varnishes, inks, dyes, plasticisers and foaming agents, which affect the indoor environment releasing mainly Volatile Organic Compounds. VOC emitted from furniture are one of the factors affecting air quality and human health.
The use of hazardous substances in manufacture, such as surface coating operations have some significant environmental impacts due to chemicals used during processes."

Improvement potential: Medium

"The improvement potential of the furniture sector lies in addressing the composition of furniture elements, reducing the addition of harmful substances, using low emission materials and low VOC emission furniture. In addition to that the design for disassembly and repair, re-use and recycle would lead to an increase of the lifespan and a decrease of the need of virgin materials and the air impacts associated to the extraction." (...)

Life cycle energy consumption

Environmental impact: Medium

"Most of the energy consumption is related to the manufacture the product, particularly in injection-moulded plastics and wood-based panels due to the use of elevated temperatures and pressures. Surface coating operations also have some significant environmental impacts due to high-temperature curing processes. Currently the use of engineered wood-based components has also grown considerably in the building sector. Injection-moulded plastics and wood-based panels have a significant impact in terms of energy consumption due to the use of elevated temperatures and pressures when manufacturing."

Improvement potential: Medium

"The improvement potential of the furniture sector lies in using different materials to plastic and metals to decrease the energy consumption during manufacturing. Increasing product durability, the reuse of components, and design for disassembly/reassembly, repair and reuse would lead to an increase in the lifespan and a reduction of the need of virgin materials and the energy for their production." (...)

Water effects

Environmental impact: Low

"The majority of furniture is made of wooden-based materials. The assessment of water depletion in the life cycle of furniture is characterized by high uncertainties mainly because it depends on many variables, like types of trees, cultivation techniques/conditions, and local climate."

Improvement potential: Low

"Due to high uncertainty in assessing water depletion impacts, possible improvement potential are low." (...)

To address the new challenges resulting from the environmental impact assessment, it is necessary to devise a set of strategies, remembering that some activities, such as raw material extraction or production, are interconnected, and any changes may impact other undesired aspects, resulting in an overall negative balance.

The application of the assessment methods / indicators presented above allows for a deeper understanding of the product to achieve the following steps:

1. Identify the environmental aspects throughout the life cycle related to energy con-

sumption, CO2 emissions, etc
2. Interpret strengths and weaknesses
3. Compare material alternatives, forms, etc
4. Identify opportunities in each stage and design an improvement plan
5. Execute a plan with main actions
6. Validate preventive impact changes
7. Obtain recognized environmental information
8. Communicate the success story if deemed appropriate

This assessment exercise offers clear advantages for the environment and the organizations themselves. Identifying impacts in the pre-production stages enables decision-making based on solid arguments to avoid or minimize negative impacts from the beginning, saving damages and costs. Furthermore, following the new trends based on responsible consumption, many companies turn the results into powerful marketing material specialized in environmental communication to promote sustainability, guiding purchasing habits with transparent information, demonstrating their commitment, and simultaneously improving their reputation.

It is crucial to properly select the human team, with decision-making power, responsible for the development project to determine the suitable product or products to work on and ensure that different circular improvement points are integrated into the company adequately within the established timeframe. The more interdisciplinary the work team, the more variety of skills, knowledge, and perspectives can be brought to address the challenges in a systemic way.

The product to be improved may, on the one hand, already be in a state of commercialization within the traditional linear system and must be redesigned, or on the other hand, it may be directly pending new development within a framework of circularity. In any case, the study must be carried out from the design stage, setting the objective and scope through a functional unit, so that decisions can have a clear and optimized impact on the rest, ensuring alignment with a circular model.

Functional Unit
To standardize the environmental evaluation process and enable comparison with similar products, it is crucial to define the functional unit beforehand, specifying a relevant quantity based on the objective and scope (e.g., a restaurant chair with a 10-year lifespan).

There are different types of environmental diagnostic tools that, based on a more or less exhaustive study, are capable of guiding conclusions both qualitatively and quantitatively. The results of quantitative assessments through numerical indicators gain higher consideration, being less subjective due to a greater introduction of data and calculation through specialized software.

Choosing the right tools depends on objectives, complexity, timelines, budget, resources, and available environmental information. This choice dictates whether to conduct the evaluation internally or seek external expertise. The assessment's validity relies on criteria selection, data availability, tool proficiency, as well as the deep knowledge of the company and the product.

The application of the tools does not modify the basic structure of the traditional design process; it simply complements it with the incorporation of an additional criterion to consider, in this case, environmental. The scope, more or less ambitious, should be determined by the company itself, taking into account its capacity and the set circular objectives, which may become the first challenge for many organizations.

With a clear context and defined functional unit, it is possible to evaluate impacts and relate them to the business model to identify opportunities without shifting impacts between stages. Different tools assist in this process, and companies must understand their differences before selection based on development stage.

Here are the most common tools:

Environmental Checklist

Tool type: Qualitative

Complexity and information level: Low

Objective: Analyse initially the environmental aspects of a product in a simple manner to identify the most significant impacts and proceed to develop an improvement plan.

Methodology: A checklist is presented, organized logically and sequentially according to the stages of the life cycle.

Advantages:
- Easy to understand
- Minimal time required
- Contemplates social and economic considerations

Disadvantages:
- Results may be superficial
- Subjective tool

Example:

An online checklist tool has been developed as part of the FurnCIRCLE project to self-assess the level of maturity and readiness to implement the circular economy.

Study phases:

1. Definition of objectives and scope
   Clearly define the intentions of the study, considering the purpose pursued.

2. Definition of evaluation criteria
   Identify the most notable aspects associated with each activity within the product life cycle and establish criteria to evaluate each one.

3. Development of questions
   Formulate specific questions related to the environmental aspects in an orderly manner, following the established criteria.

4. Development of a scoring system
   It is important to assign a value to each question based on its possible answers to quantify the results coherently.

5. Analysis and evaluation
   Complete the checklist with the pertinent answers, then evaluate the collected data according to the established scoring system.

6. Interpretation of results
   The results obtained from the scores serve as a basis to guide the organization in implementing improvements.

Ecodesign Strategy Wheel / Spider Diagram

Tool type: Qualitative

Complexity and information level: Low

Objective: Position a product, or more than one for comparison, with respect to environmental improvement strategies, identifying those with the greatest impact potential associated with the stages of its life cycle. With this, it helps to identify the characteristics that the product should have.

Methodology: Once data is collected, the results are reflected in a spider diagram, allowing for the representation of critical points and enabling comparisons between products or between a product and redesign proposals, graphically perceiving the differences.

Advantages:
- Simple data collection
- Minimal time required
- Easy to understand
- Easy comparison between products

Disadvantages:
- It does not contemplate impacts
- Subjective tool

Study phases:

1. Definition of objectives and scope
   Clearly define the intentions of the study, considering the purpose pursued.

2. Analysis
   Select and qualitatively analyse potential environmental improvement strategies, associating them with the different stages of the product life cycle.

3. Evaluation
   Qualitatively evaluate the strategies on a scale from 0 to 10, based on the degree of implementation and environmental improvement, then obtain an average value for each stage.

4. Graphical representation
   Represent the obtained results in a diagram formed by axes corresponding to each strategy associated with each stage of the life cycle.

5. Interpretation of results
   The area determined by the connection of each value is understood as the level of environmental impact. The larger the area, the lower the potential impact.

Example

Concept improvement
- Dematerialising
- Efficiency
- Shared use of the product
- Integration of functions
- From products to service

Low-impact materials
- Elimination of toxic compounds
- Renewable resources
- Recycled materials
- Recyclable materials
- Reusable materials

Low energy content
- Reduction of materials
- Weight reduction
- Volume reduction

Production impact reduction
- Renewable energy
- Reduction of energy consumption
- Reduction of production process
- Emissions reduction
- Maintenance improvements
- Less production waste

Distribution impact reduction
- Optimized packaging in volume and weight
- Packaging made from recycled materials
- Recyclable packaging
- Packaging reuse
- Reduction of energy consumption
- Efficient logistics

Use optimization
- Timeless design
- Universal design
- Customizable
- Multifunction
- Efficient resource consumption

Product life optimization
- Reliability and durability
- Easy maintenance and repair
- Upgradable
- Anti-obsolence
- Modularity

Optimization end-of-life system
- Reuse
- Remanufacturing
- Recycling
- Product take-back
- Composting
- Energy generation

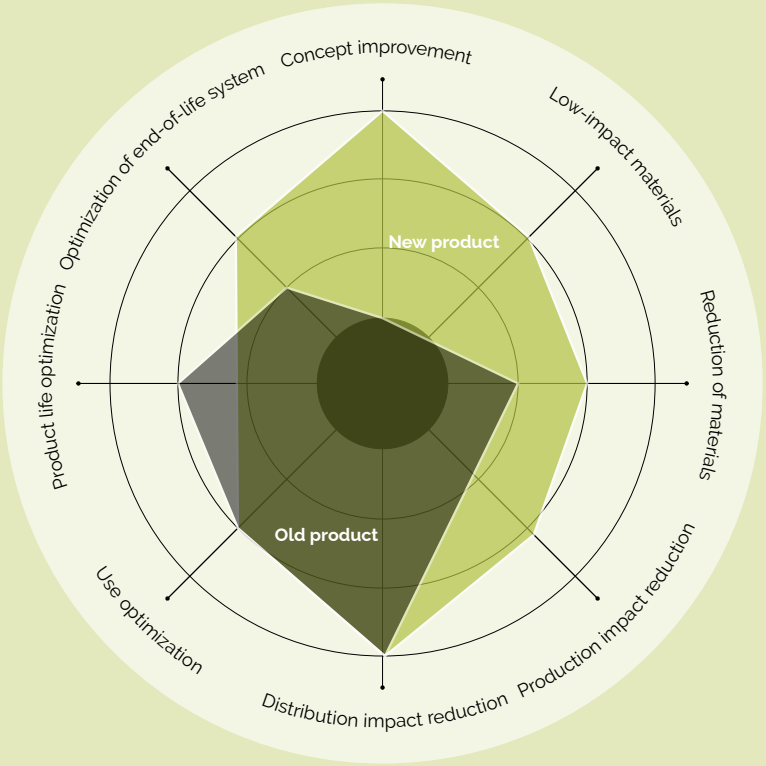


Figure 12 Spider diagram

MET matrix (Materials, Energy, Toxicity)

Tool type: Semi-quantitative

Complexity and information level: Low

Objective: Identifies and generally calculates the resources used and emissions generated at different stages of a product's life cycle to help determine priorities for improvement strategies to be implemented in the short and long term.

Methodology: Evaluate using a matrix in a quantitative and qualitative manner, following a simpler process than the one used to perform a Life Cycle Assessment (LCA).

Advantages:
- Detects main problems and the stages where they occur
- Facilitates decision-making
- Simple data collection
- Easy to understand

Disadvantages:
- Objectivity depends on the quality of the data input
- It does not contemplate impacts
- Difficult for complex products

Study phases:

1. Definition of objectives and scope
   Clearly define the intentions of the study, the product to be studied, geographical and temporal boundaries, and the functional unit, considering the purpose pursued.

2. Data collection
   Gather information in a simple manner from the different stages of the product life cycle to determine the flows.

3. Matrix development
   Incorporate all quantitative and qualitative data into a matrix, organizing them into material resources, energy resources, and pollutant emissions, in relation to the different stages.

4. Interpretation of results
   Evaluate and draw conclusions from the collected information to propose environmental improvement strategies.

Example

	Material resources	Energy Resources	Pollutant emissions
Extraction and production of materials	Raw materials ( )	Energy consumption necessary for the extraction, obtaining and transportation of raw materials ( )	Mining waste, wastewater and atmospheric emissions generated ( )
Production	Auxiliary substances used during production ( )	Energy consumption used during production processes ( )	Waste resulting from processes ( )
Distribution	Packaging materials ( )	Energy consumption during transportation ( )	Packaging waste and waste resulting from combustion during transport ( )
Use and maintenance	Consumables and spare parts ( )	Energy consumption during use of the product, maintenance or repairing ( )	Waste of consumables and spare parts ( )
End-of-life	Consumption of substances used during waste treatment ( )	Consumption of energy used during transportation and treatment of waste ( )	Waste discharged or generated during combustion ( )

Chart 1 MET matrix (Materials, Energy, Toxicity)

Standard Eco-indicators

Tool type: Quantitative

Complexity and information level: Medium

Objective: A tool especially aimed at designers so they can objectively analyze the product life cycle through a relatively easy process, allowing them to identify critical environmental impacts and subsequently incorporate improvements.

Methodology: Analyse the different stages of life cycle with numbers that express the total environmental impact, called Standard Eco-indicators. The higher the value, the greater the environmental impact.

Advantages:
- Facilitates decision-making
- Facilitates product comparisons
- Comprehensive product evaluation
- Detects the impact
- Contemplates damage categories

Disadvantages:
- Uncompleted method
- For internal use

Study phases:

1. Establish the purpose
   Define the objective and depth of the study and describe the product or component to be analyzed.

2. Define the life cycle
   Define the life cycle analysing the production, use and waste processing.

3. Quantify materials and processes
   Determine the functional unit and quantify the processes.

4. Fill in the form
   Note the materials and processes with the amounts finding the relevant Eco-indicator values and multiply the amounts.

5. Interpret the results
   Check the results with purpose established.

Example

	Amount	Indicator	Result
Material 1	( )	value associated ( )	X
Material 2	( )	value associated ( )	X
Process 1	( )	value associated ( )	X
Process 2	( )	value associated ( )	X
Process 3	( )	value associated ( )	X
		Total Production (mPt)	**X**
Transport 1	( )	value associated ( )	X
Transport 2	( )	value associated ( )	X
		Total Use (mPt)	**X**
Waste treatment 1	( )	value associated ( )	X
Waste treatment 2	( )	value associated ( )	X
		Total Disposal (mPt)	**X**
		Total All stages (mPt)	**X**

Chart 2 Eco-indicator's form

Figure 13 Representation of a product's impact on the production, distribution, and end-of-life stages

LCA (Life Cycle Assessment)

Tool type: Quantitative

Complexity and information level: High

Objective: Objectively evaluate and identify the environmental impacts associated with a product across its various life cycle stages by compiling and quantifying data related to the materials and energy used, as well as the emissions released into the environment.

Methodology: Systematically and sequentially analyse the different stages a product undergoes, from raw material extraction and processing, through manufacturing, distribution, use, to end-of-life. There are currently databases and various specialized software tools available to assist in this process (e.g. openLCA or SimaPro).

Advantages:
- Precision of results regarding impact categories
- Facilitates decision-making
- Facilitates product comparisons
- Helps comply with regulations and be more competitive
- Tool for transparent communication
- Official recognition

Disadvantages:
- Difficulty in data collection
- Time-consuming
- Requires training
- Costs of specific software licenses and database

Study phases:

1. Definition of objectives and scope
   Clearly define the study's intentions, the product to be studied, geographical and temporal boundaries, and the functional unit, considering the purpose pursued.

2. Inventory analysis
   Identify and quantify in detail the inputs (consumptions) and outputs (emissions) of the system, defining everything in a flow diagram.

3. Impact assessment
   Apply calculation techniques to the input data to evaluate impact categories such as resource depletion, ozone layer destruction, toxicity, etc, with a specific tool.

4. Interpretation of results
   Present the results according to the defined objective, considering that the study's accuracy will depend on the quality of the data.

Example

Impact Categories	Amount	Material 1	Material 2	Material 3	Unit
Mineral resource scarity	( )	X	X	X	Kg Cu eq
Ozone layer destruction	( )	X	X	X	Kg Nox eq
Global warming	( )	X	X	X	Kg CO2 eq
Human toxicity	( )	X	X	X	Kg 1,4-DCB
Acidificafion	( )	X	X	X	kg SO2 eq
Eutrophication	( )	X	X	X	Kg P eq
Ecotoxicity	( )	X	X	X	Kg 1,4-DCB
Land use	( )	X	X	X	m2a crop eq
Water consumption	( )	X	X	X	m3
Radiation	( )	X	X	X	kBq Co-60 eq

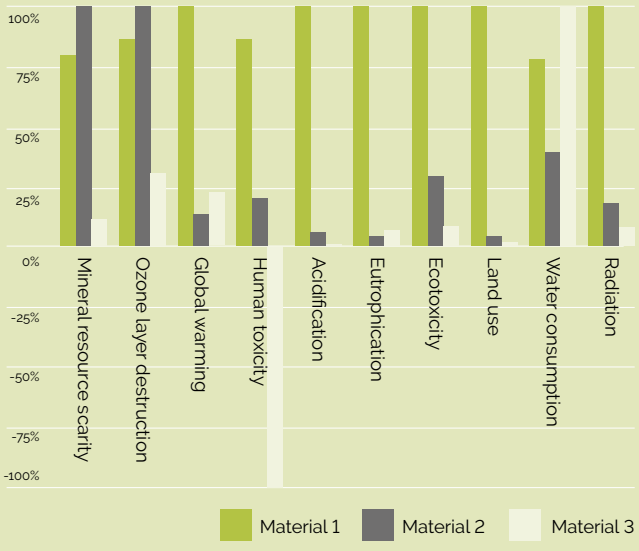


Chart 3 Impact Assessment during life cycle
Figure 14 Relative contribution to different environmental impacts

8 circular design strategies and good practices

As mentioned in the previous section, design has a critical influence in the determination of the life cycle of products and, to a large extent, their resulting impact. The same happens on a business scale; we must proactively plan business actions, tactics, and strategies, as doing so can anticipate, reduce, or even eliminate future impacts that may occur.

It is extremely important to apply sustainability criteria in this initial planning phase, and it is why 30 strategies applicable in the furniture sector are proposed below. These are presented in order according to the product life cycle, although some of them could be in different phases.

It is not the intention that all of them be applicable to the same product or action, so the nature of each one, its limitations, and the manufacturer's situation must be considered. In the case of products already available on the market, it is recommended to study progressive changes that can improve them, as small changes can represent a considerable improvement in the long term.

Before choosing one strategy or another, it is essential to have a deep understanding of the company's area, product, or product family where it will be applied, including the impacts generated at that specific point. Without this knowledge base, we may propose a solution to something that already works, potentially worsening its environmental performance. That's why it's always recommended to start with thorough research before proposing any solution to anything.

These strategies should therefore be understood as tools within a toolbox; not all are suitable for every situation and sometimes they can interfere with each other. It is the judgement of the individual or team selecting them, who must decide whether one or several can be useful for the proposal being developed or for environmental improvement. If any are linked to a EU regulation, it is indicated accordingly.

To guide the reader, it has been considered convenient to indicate the level of circular maturity required in the company for the implementation of each strategy. The values assigned have been defined with the participation of more than 50 experts and are as follows: "easy", means that companies with a basic level of circular maturity can implement it perfectly; "medium difficulty" means that it requires a greater effort from companies; "complex" means that the strategy is difficult to implement and probably only companies with an advanced level of circular maturity can do it.

All good practices of the circular economy are classified into two functional business blocks of the CANVAS model of the value chain (Value Generation or Value Delivery) and into three impact blocks (Costs, Benefits, or Value Proposition) so that the effect of the circular economy can be better understood transversally across the company and the business model. The CANVAS model should be understood as an equation: the more improvements are made in Value Generation and Value Delivery, the better the Value Proposition and Benefits will be.

The graphics below the strategy titles show which business blocks of our CANVAS model are affected by each strategy (first the names and then the position in the model). They also show how difficult the strategy is to implement (easy, medium or complex). Finally, there is a QR code that links to an online document with information on the good practices of the companies mentioned below.

Design phase

Local economy

Description

Operating at a local economy scale enhances the circulation of investment at the community level, promoting socio-cultural values, helping to create jobs and development in different sectors. It creates a system supported by small and medium-sized businesses whose can include production, distribution and consumption. From an environmental point of view, reducing distances during processes by working in a local scale decreases the carbon footprint associated with transportation, while at a social level it strengthens coexistence and collaboration.

In fact, nature works exactly like that, taking nearby resources, connecting them and transforming them to generate value at all levels of the chain and for all the actors involved.

Companies good practices

- ARREDAMENTI DEFRANCESCO
- Barth Innenausbau S.a.S. di Ivo Barth S.r.l. & Co.
- Centro Formazione Permanente ENAIP Tesero
- Daniel Gill Furniture Maker
- Eco Materials AS
- Kewlox
- KNOF
- La Pecera Mallorca
- L'ESTOC
- Marczak
- OpenDesk
- PALM Green Pallet Società Benefit
- Poliform
- SLOWDECO
- Søuld
- SPOINQ
- TUNDS
- Vestre
- Zordan srl SB
- 3B S.p.A.

Retention of craft skills

Description

After years of discredit under an industrialization system propelled by technology and innovation, the uniqueness of hand-making and the figure of the artisan begins to be appreciated within the new trends of ethical consumption, that involves fair conditions for producers and try to retain the cultural values. Manual production, including hand work and modern machinery use, allows high customisation and high-quality standards, contributing to the product longevity.

A balanced economy is capable of operating both industrially and on a smaller scale, and both scales are essential. With the latter, value is generated bringing benefits to smaller actors, while connecting the products with the tradition and culture of the place.

Companies good practices

- Artigian Mobili di Rossi Nazareno & C. S.n.c
- Atelier365
- Bazzi Fratelli
- BOTTEGA GHIANDA
- CARPINTERIA EXPANDIDA
- Centro Formazione Permanente ENAIP Tesero
- CUMELLAS
- De La Espada
- EXPORTMIM
- GET LAID BEDS
- Hamran
- HOUTDRAAIERIJ VAN ZELST
- INTERNO ITALIANO
- KOROŠKA CRAFTSMANSHIP CENTRE
- Lviv Furniture Cluster
- MEG Trading
- PET Lamp
- PROMEMORIA
- Riva 1920
- TOUCHWOOD
- Trabczynski
- TUNDS
- Valcucine
- Wewood
- Wood Saint

Product-service system (PSS)

Value Delivery (Experiences) | Relationship spaces | Value proposal

Complex | Medium | Easy

Description

The PSS (Product-Service System) is a business model in which the company provides products through a service system capable of satisfying the user continuously, unlinking ownership from the real value of use. Among the possible alternatives in the product-service system models are the production of made-to-measure custom furniture, maintenance or repairing, or monitoring of the products throughout their life cycle.

This complementarity between product and service, besides gaining customer loyalty, achieves important reductions in manufacturing costs and environmental impact, thanks to the reuse of components and materials recovery. In parallel to all of this, products designed to operate in a PSS model tend to have a longer lifespan due to their repairability or adaptability, bringing environmental, economic and social improvements.

Companies good practices

- ABSOTEC - ABSORCIÓN ACÚSTICA
- AERON REPAIRS
- Ahrend
- Akron
- ALPES
- Beneens
- Bussola & Ralph International S.r.l.
- Colors of Design
- ECOMAISON
- FEATHER
- Green Furniture Concept
- Hannabi
- IKEA
- LENSVELT
- LIVE LIGHT
- Loopfront
- LYGHT LIVING
- Martela
- NORNORM
- OKA office furniture
- Poltrona FRAU
- Sinko S.r.l.
- SWAAP

EU strategies and legislations	Implications
Ecodesign for Sustainable Products Regulation (ESPR)	It will promote repair and refurbishment services
Right-to-repair Directive	It will oblige manufacturers to provide repair options

Inclusive design

Value Delivery (Experiences) | Clients and beneficiaries | Value proposal

Complex | Medium | Easy

Description

In the face of a heterogeneous society, products must be accessible to ideally everyone. It is important to understand that capacities of people that can vary in time/following the different life phases, also depends on environment conditions. So, if they are unfavourable, additional limitations can arise.

Current regulations provide basic ergonomics standards, but inclusive design implies expanding the vision and sometimes requires a certain innovation and commitment from the manufacturer. Focusing on a big diversity of users and their specificities, the potential user base can be increased, reaching a bigger number of customers. It's important to notice that people capacities vary during time, so if the experience based on the product's functionality is satisfactory, probably consumer will develop the desire to extend its useful life and be concerned about proper maintenance. As a result, its value remains longer without the need to be replaced, and at the same time, the manufacturer gains in brand perception.

Companies good practices

- Arredo Uno S.r.l.
- Arredolegno S.r.l.
- BD Barcelona
- Corazzolla S.r.l.
- GRUPPO LUBE
- HAWORTH
- NOO.MA
- PALM GreenPallet Società Benefit
- TINK THINGS
- Vergés
- Winncare

Upgradable and customizable design

Description

A business model where products can be adapted to specific needs, allows the final user to obtain a personalized product, increasing the chances of success, and that applies to both B2B and B2C models.

When there is also the opportunity to upgrade or add elements after their sale, the product can evolve with the user, adapting to new preferences and needs, enhancing the functionality, performance, capacity, or aesthetics. This adaptability enhances the connection between product and user, fostering that the user extends its useful life, while increasing the brand loyalty.

Companies good practices

- ABSOTEC - ABSORCIÓN ACÚSTICA
- Arredamenti Defrancesco S.r.l.
- Artigian Mobili di Rossi Nazareno & C. S.n.c
- Barth Innenausbau S.a.S. di Ivo Barth S.r.l. & Co.
- BASTA
- Corazzolla S.r.l.
- COZMO
- Cumellas
- Donar
- Ènola
- Herman Miller
- HI-PO
- ID4Care
- MDF Italia
- Möbeltischlerei Schraffl OHG d. Schraffl Kandidus & Co.
- Mobitec
- NOO.MA
- PALM GreenPallet Società Benefit
- Stokke

EU strategies and legislations	Implications
Ecodesign for Sustainable Products Regulation (ESPR)	It will promote the upgrade of the product to prolong its useful life

Anti-obsolescence

Description

The current consumerism, where the goal is to make people buy the maximum number of products with the maximum possible frequency, has been characterized by a large-scale purchase of goods that compromises natural resources and a sustainable economy.

Sooner or later, companies focused on trends and "fast houseware" will be forced to change their business model to create alternative value propositions focused on use and durability both aesthetic and physical, through design, materials quality and maintenance possibility. Customer education will be essential in this transition as product durability is also influenced by how users understand and use products.

Companies good practices

- AOO by Marc Morro
- ARTEK
- BENCHMARK
- CASSINA
- CUMELLAS
- Fjordfiesta
- Kler
- Søuld
- TYLCO
- VITRA
- VITSOE

EU strategies and legislations	Implications
Ecodesign for Sustainable Products Regulation (ESPR)	It will promote the durability of goods
Right-to-repair Directive	It will oblige manufacturers to provide repair options to prolong products' useful life
Empowering consumers for the green transition – Directive	It prevents practices associated with the early obsolescence of goods

Dematerialization

Value Generation (Operations) | Key resources | Cost

Complex | Medium | Easy

Description

Logically, design and materials selection must be in accordance with the requirements of the final product. An optimized use of raw materials allows for adjusting the necessary resources of a product to specific needs. This can be achieved through efficient design that achieves more with less, thereby improving material use, using more efficient manufacturing processes, and decreasing waste generation, but of course it cannot be detrimental to durability.

Weight is usually a non-considered criteria when choosing materials and designing furniture, and putting in the market a lightweight product in this sector, where products are usually large and heavy, is an enormous challenge. The challenge of dematerialization can potentially increase the level of productive innovation and the competitiveness of the company, translating into an economic benefit in short, medium and long term.

Transportation is one of the main reasons for the fossil resources extraction and pollution. The amount of fuel or energy required for each journey varies according to the weight and the volume to be transported, causing a greater environmental impact if both characteristics are high.

Companies good practices

- ABSOTEC - ABSORCIÓN ACÚSTICA
- Archiproducts
- BAUX
- Egger
- Flokk
- Furnitureokay
- Giorgetti spa
- IGEL e.V. association
- KENYON YEH
- Layer Design
- Magis
- Molo Design
- Moroso
- Steelcase
- Zuo Modern

EU strategies and legislations	Implications
Ecodesign for Sustainable Products Regulation (ESPR)	It will promote the efficient use of resources through ecodesign requirements

Material resources phase

Limited number of material types

Description

Reduction of the number of different material types included in a product allows the product to have a more optimized production process, with less suppliers, less production stages, and components and materials traveling lower distances. These aspects will in general positively impact the final price, but also improve its environmental impact.

It also makes it easier for selective waste collection. A simpler material composition, ideally with only one single material type, allows a more efficient material recovery in the recycling process, also in terms of cost-efficiency.

Companies good practices

- BANANA TEX
- DITTA ROMANO ANDREA
- LUFE
- RONGO
- Søuld
- Steelcase
- The Wood Tailor
- VEPA

EU strategies and legislations	Implications
Ecodesign for Sustainable Products Regulation (ESPR),	It will promote the design for recycling (e.g. number of materials and components used)

Locally sourced materials

Description

Materials play a very important role in determining the environmental impact range of a product, and their origin is one of the most influential aspects. In a globalized world, it is very common for the materials in the furniture we use to have travelled thousands of kilometres, from the fossil fuels that some plastics are based on, to the distant origin of some woods and components. Sourcing locally reduces transport and consequently fuels, energy, and greenhouse gas emissions.

Local materials provide social and economic benefits by helping to strengthen regional identity or empowering local businesses.

Companies good practices

- Arredamenti Defrancesco S.r.l.
- BOIS LOCAL
- Cocco Wood S.r.l.
- Corazzolla S.r.l.
- DAM
- Ercol
- Fix Street Furniture
- HUIS VEENDAM BIOLAMINATES
- Minus Furniture
- Planterial
- Robinwood
- Rustiklegno di Zadra Massimo
- Sebastian Cox Ltd.
- Slow Design 44
- Søuld
- Tacchini
- Tosconova srl
- Zordan srl SB

Renewable sources

Value Generation (Operations) | Key resources | Value proposal | Complex | Medium | Easy

Description

Renewable materials are extracted from the environment and can be generated naturally at a rhythm that compensates the extraction we provoke, so they represent a clear advantage in terms of sustainability. However, their obtention can still produce high impacts, like it happens for example in the case of cotton crops, due to intensive use of water and fertilizers, so a responsible production and consumption is essential. In addition to this, if consumption is faster than this process takes, they can also be depleted.

In the furniture sector, for example, wood is a relevant and traditionally widely used renewable resource, but it is essential to ensure that tree felling is done in a controlled manner with an adequate traceability along the whole value chain, where verification and certification have an important role.

Companies good practices

- BANANA TEX
- DITTA ROMANO ANDREA
- LUFE
- RONGO
- Søuld
- Steelcase
- The Wood Tailor
- VEPA

EU strategies and legislations	Implications
Ecodesign for Sustainable Products Regulation (ESPR)	It will promote the use or content of sustainable renewable materials
Deforestation free products Regulation (EUDR)	It will guarantee the use of wood in products that have not contributed to forest degradation.

Avoidance of surface treatments and toxic substances

Value Generation (Operations) | Activities and processes | Value proposal | Complex | Medium | Easy

Description

To improve durability, it is often necessary to apply chemical substances as paints, varnishes, or other surface treatments. This may affect other sustainability aspects such as material recovery and recyclability once it has reached the end-of-life stage, since they make the composition of materials more complex, and often they are impossible to separate from the base material where they are applied.

During waste management, any type of surface finish devalues the raw material, adding complexity for its optimal recovery, sometimes avoiding the opportunity for reintroduction into the value chain. The same can happen with glues, which can also negatively affect an efficient recovery. Sometimes, these substances contain toxic compounds, such as formaldehydes, which especially affect indoor air quality by emitting volatile organic compounds (VOC).

For this reason, it is necessary to find the right balance in their application, avoiding the toxicity of some solutions by opting for less aggressive substances to minimize environmental and health impacts. Nevertheless, durability remains a key factor in sustainability within the furniture sector, which is why many of these treatments or solutions remain highly significant.

Companies good practices

- CUMELLAS
- DECOWOOD
- FIEMME TREMILA
- M Sora
- PLANTICS
- Riva 1920
- Silvaprodukt
- Sixay furniture
- Søuld
- SURU
- Woodly
- ZEITRAUM

EU strategies and legislations	Implications
Ecodesign for Sustainable Products Regulation (ESPR)	It will promote the substitution or elimination of substances of concern (e.g. those that negatively affects the reuse and recycling of materials in the product in which it is present)
The Chemicals Strategy	It will limit the use of hazardous substances in products and will promote the use of alternatives.

Secondary raw materials

Description

The reintroduction in the chain is one of the most important solutions of circular economy, and to create a market for secondary materials is essential. After proper post-consumer waste management and transformation into new raw materials with quality standards, new opportunities arise for those companies that seek to complete the circle, whether from their own waste or not.

Recycling brings environmental, economic, and social advantages. Not only it reduces the volume of materials that reaches landfills, it also minimizes the consumption of virgin resources and enhances the so called "green jobs," contributing to the preservation and restoration of the environment. In countries with few natural resources like those in Europe, increasing the circularity of materials and reducing dependence on external sources is a strategic factor for competitiveness.

Companies good practices

- AECTUAL
- Artek
- Blade Bridge
- COMPOSAD
- Connubia
- Cumellas
- Donar
- Dvelas
- ecoBirdy
- ECONOR Design
- Econyl
- EMECO
- FALCO
- FORESSO
- FUTUFU
- GRUPPO SAVIOLA
- HÅG Celi
- Interface
- INTERPLASP
- Kartell
- KRILL DESIGN
- M Sora
- MAISON TOURNESOL
- Maximum
- MOBLES114
- Naeste
- NNOF
- PAOLA LENTI SRL
- PLANQ
- PLASTICPeople
- Ressourcerie
- Namurois
- RetroWood
- Revolución Limo
- SAIB
- SANCAL
- SOLUZIONE ARREDAMENTI
- The Good Plastic Company
- Umanotera
- UPCYCLE BERLIN
- VEPA
- Vestre
- WOODSTOXX

EU strategies and legislations	Implications
Ecodesign for Sustainable Products Regulation (ESPR)	It will promote the recycling of products and the use of recycled materials through ecodesign requirements
Green Public Procurement	The use of a minimum quantity of recycled material is a commonly used selection criteria in green purchasing

Materials with certified labels

Description

There are many eco-labels that identify and promote sustainable raw materials and their sourcing from certified sustainable practices. These certifications allow the selection of materials to be made based on more reliable criteria. They certify multiple aspects throughout their material obtention and distribution and are applied and controlled following a certification and audit process by a third-party independent or recognized prestige.

The most common eco-labels in the furniture industry are FSC and PEFC for wood, as a guarantee that it comes from responsibly managed sources, but there are many others related to a certified origin of recycled plastics, textiles, and even metals. Applying materials certified by a trusted entity allows us to ensure that we are using raw materials with minimum environmental or even ethical standards, thus increasing the perceived value of the products we manufacture with them.

Companies good practices

- ABSOTEC - ABSORCIÓN ACÚSTICA
- ANDREU WORLD
- Arredolegno S.r.l.
- Artek
- Brühl
- Friul Intagli Industries S.p.A.
- HANNUN
- Möbeltischlerei Schraffl OHG d. Schraffl Kandidus & Co.
- Norsk Tekstilgjenvinning AS
- Sinko S.r.l.

EU strategies and legislations	Implications
Ecodesign for Sustainable Products Regulation (ESPR)	It will define information requirements for some products, through product labels
Deforestation free products Regulation (EUDR)	It will define information requirements about due diligence
Green claims Directive	It will fix the rules for using ecolabels to avoid greenwashing
Green Public Procurement	The use a certified label is a commonly used selection criteria in green purchasing

Production phase

Closed-loop recycling

Value Generation (Operations) | Activities and processes | Cost | Complex | Medium | Easy

Description

One way to reduce the impact and minimize material costs in a company is to self-manage the recycling process to convert one's own waste into raw material and be able to reuse it for the same purposes.

Although it is an investment and a challenge for the logistics of the company, recycling through a closed circle provides full control of the life cycle and the recovery of the waste without losing its properties, revaluing it each time. This obviously increases the percentage of acquired material that is placed in products and does not become waste, thus increasing margins and efficiency while reducing the environmental impacts.

Companies good practices

- AUPING
- FAMA SOFAS
- GABRIEL
- Homm Bútor
- Magis
- PANESPOL
- Tvilum
- UNILIN

EU strategies and legislations	Implications
Ecodesign for Sustainable Products Regulation (ESPR)	It will consider the amounts of waste generated, including plastic waste and packaging waste and their ease of reuse, and amounts of hazardous waste generated
Waste Framework Directive	It could fix limitations for furniture wastes in the future, including an Extended Producer Responsibility scheme for these products.

Water use efficiency

Value Generation (Operations) | Supply chain | Cost | Complex | Medium | Easy

Description

It is important to review the production systems that require the use of water in order to optimize resources to the fullest. It's also essential to assess the implementation of a purification, recovery and reuse system. Water footprint is an important impact factor, although it is not talked about as much as carbon footprint. In a European context where some areas of the continent are facing increasingly frequent drought problems, efficiency in water use has become an essential requirement for competitiveness and even survival for many companies.

In applications such as textiles, surface treatments like paintings or the production of paper and cardboard packaging, all of them really common in the furniture sector, consumption can also be high, necessitating measures for proper water management.

Companies good practices

- CERVIN
- Cumellas
- Teemill
- Panguaneta
- Estel
- E. Vigolungo
- Ritmonio

EU strategies and legislations	Implications
Ecodesign for Sustainable Products Regulation (ESPR)	It will consider the use or consumption of water in one or more life cycle stages of the product

Renewable energy sources

Description

Solar, wind, hydroelectric, geothermal and biomass are the most common renewable energies applied in the industry as an alternative to traditional fossil energies. Many companies see them as an opportunity to make profit in both environmental and economic terms. The use of renewable energies helps combat climate change and decrease product's environmental footprint while showing a commitment to sustainability and improving brand image.

Another important aspect is the competitiveness they offer through energy independence and significant cost reduction. Given the progressive increase in fossil fuel prices, whether due to geopolitical reasons or the rise in associated taxes, the search for alternative energy sources is an essential step for the industrial sector and in the furniture industry.

Companies good practices

- ACOMODEL
- Brzost
- CERVIN
- CORNELLI GROUP
- De Vorm
- Mintjens
- PUNT MOBLES
- SCAVOLINI SPA
- Valiyan
- Vestre

EU strategies and legislations	Implications
Ecodesign for Sustainable Products Regulation (ESPR)	It will consider the use or consumption of energy in one or more life cycle stages of the product

Distribution phase

Low impact materials for packaging

Value Delivery (Experiences) | Relationship spaces | Benefits

Complex
Medium
Easy

Description

Packaging contributes to the impact of a product significantly, so its impact should not be underestimated, and the choice of its materials is one of the most relevant aspects to consider.

When it comes to single-use packaging, that has to be used in the lowest possible quantity without sacrificing the product's protection, the best options are to choose renewable, biodegradable, or recycled materials. It is particularly relevant in the current context to use materials with good recyclability, as single-use packaging waste has become a major environmental issue, and its reintroduction into the supply chain is one of the key solutions. Studying the type of product and the specific function helps to determine the most suitable option.

Companies good practices

- Cruz foam
- JYSK
- NOMON
- Mushroom Packaging by Ecovative
- PLUUMO
- SULAPAC
- STORA ENSO

EU strategies and legislations	Implications
Ecodesign for Sustainable Products Regulation (ESPR)	It will consider the weight and volume of the product and its packaging, and the product-to-packaging ratio
Packaging and packaging waste Regulation	It will limit the type of packaging materials and their quantity

Communication of sustainable issues

Value Delivery (Experiences) | Relationship spaces | Value proposal

Complex
Medium
Easy

Description

Packaging is a perfect tool for the manufacturer to develop a communication strategy based on sustainability. In B2C, often the packaging is the first or even the only point of contact of the brand with the user, as once the box has been opened, the brand's opportunity to interact with the user disappears. Providing a good user experience with the packaging can be a differential factor in explaining to the user the brand or product values, as well as its environmental aspects.

Additionally, through Digital Product Passports (DPP) or QR codes or any other methods, packaging can be linked to assembly instructions, maintenance and repairability manuals, recycling instructions or other didactic resources that complement the information, such as the web or social media. Transparency and data-driven communication build trust and brand equity. In this way, the aim is to engage the user effectively in circularity.

Companies good practices

- Joolz
- COR
- MillerKnoll
- Gruppo
- Saviola
- KARTELL
- LiveLight
- Lago

EU strategies and legislations	Implications
Ecodesign for Sustainable Products Regulation (ESPR)	It will define information requirements for some products, through product labels and digital product passport
Green claims Directive	It will fix the rules for using ecolabels to avoid greenwashing
Empowering consumers for the green transition – Directive	It will limit unfair commercial practices that mislead consumers, including misleading environmental or social claims

Packaging reduction

Value Delivery (Experiences) | Relationship spaces | Benefits | Complex | Medium | Easy

Description

Packaging is a complementary element of the product, necessary to protect it and ensure that its life cycle is not interrupted during storage and transportation. In this way, while adding protection, it adds impact to the product and must be optimized as much as possible to fulfil its function with the minimum material quantity and volume, obtaining minimal waste

Besides developing a packaging proposal focused on this, the product must have previously been designed with logistics in mind. To achieve a good "flat-pack" result, it's important to have a skilled design team capable of projecting easy disassembly through simple resources that facilitate the future assembly. A considerable reduction in the product volume, besides cutting costs, optimizes space and generates less environmental impact by reducing fuels or energy used during transportation.

A good compromise between an optimized packaging and adequate protection, with a design that allows easy assembly and handling, both in logistics and by the end-user, is a key factor in improving logistics costs, especially in a context where markets are increasingly global.

Companies good practices

- CORVASCE
- Cumellas
- Ecole Cantonale d'Art de Lausanne
- Fészek Részek
- Greyfox
- Hakola
- IKEA
- King & Webbon
- Kinnarps
- Magis
- One to One
- PALM GreenPallet—Società Benefit
- Potr
- Refurbed
- Sixay Furniture
- Studio Boca
- SURU
- TAKT
- TYLCO

EU strategies and legislations	Implications
Ecodesign for Sustainable Products Regulation (ESPR)	It will consider the weight and volume of the product and its packaging, and the product-to-packaging ratio
Packaging and packaging waste Regulation	It will limit the type of packaging materials and their quantity

Use phase

Multifunctionality

Description

Through multifunctionality, it is possible not only to improve the product perception through the different uses that can be given to it, also a reduction in the number of associated products and resources needed to meet specific needs. It is necessary to apply multifunctionality with discernment, as there are products on the market with forced multifunctionality that complicate the products without users properly taking advantage of it. As always the satisfaction that the user obtains with a product will determine his effort and investment in repairs and, consequently, the length of the life cycle

Companies good practices

- C+S Architects
- Campeggi
- STOKKE
- VITRA
- Woo Furinture
- Clei
- MDF Italia

EU strategies and legislations	Implications
Ecodesign for Sustainable Products Regulation (ESPR)	It will consider the functional performance and conditions for use of the product

Repairability and ease of maintenance

Description

If the manufacturer adopts maintenance as a strategy, the products must be designed to facilitate and encourage the disassembly and subsequent repair or replacement with commonly available spare parts. Making this process efficient is just as important as the simplification of the tools needed. A company that chooses to facilitate the maintenance of its products achieves a more stable relationship with its customers, while also gaining other sources of income beyond just product sales, such as spare parts sales or maintenance services.

Through a good design, the user is able to understand the composition of the products and their construction, without the need of being an expert. Therefore, self-confidence is increased and consequently predisposition to extend the useful life of the product.

Companies good practices

- Cumellas
- Finline Furniture
- Flokk
- FLOS
- KHAMA
- LAFUMA MOBILIER
- MDF ITALIA
- Nardi
- Orangebox
- Steelcase
- Stykka
- ZEITRAUM

EU strategies and legislations	Implications
Ecodesign for Sustainable Products Regulation (ESPR)	It will promote the ease of repair and maintenance, as expressed through characteristics, availability, delivery time and affordability of spare parts, etc.

Reliability and durability

Description

In recent years, fast houseware is being more and more discussed due to the increasing sales of household items that encourage compulsive buying. This concept goes against the principles of circularity, as products are manufactured with low-quality materials and are generally neither durable, resistant, and quickly repairable, with a tendency to devaluation. That's a very negative trend, especially in a sector where products were traditionally manufactured to have long durability, capable of extending their lifespan across multiple generations.

The new regulations seek a minimum reliability and durability of the product under normal conditions of use. But sometimes durable design might interfere with some strategies like design for an easy recycling, so the overall balance between longer lifetime and environmental impacts needs to be considered.

Companies good practices

- COZMO
- Donar
- Emeco
- Enea Design
- Kewlox
- Riva 1920
- Søuld
- Vitra

EU strategies and legislations	Implications
Ecodesign for Sustainable Products Regulation (ESPR)	It will promote the durability and reliability of the product or its components as expressed through the product's guaranteed lifetime, technical lifetime, etc.

Modularity

Description

Modularity refers to the design principle where a product is made up of separate, interchangeable components or modules that can be independently created, modified, replaced, or exchanged to customize or repair the product. The flexibility of a modular product adapts to changing needs over time, so the materials and solutions used must be specially designed for durability.

At the cost level, on the one hand it is understood that savings will be generated in production due to the repetition of the same pieces, and on the other, the consumer can value the initial purchase investment in a particularly profitable way taking into account the possibilities of use that it will be able to generate for a long time.

Modularity can also contribute to an efficient transport and distribution, as the product is divided in parts, and can also bring a better recyclability, as commonly the different elements of the system can be easily separated and managed independently as waste

Companies good practices

- BASTA
- CITYSENS
- COZMO
- Cumellas
- Edsbyn
- EMUCA
- GRUPPO LUBE
- KITCHEN FOR LIFE
- KOOKAM
- SLOWDECO
- Snøhetta
- USM
- Valcucine

EU strategies and legislations	Implications
Ecodesign for Sustainable Products Regulation (ESPR)	It will consider design aspects such as ease of non-destructive disassembly and re-assembly. Also, it considers modularity as an aspect to be considered to promote ease of upgrading, reuse, remanufacturing and refurbishment.

Human-powered products

Value Delivery (Experiences) | Stakeholders | Benefits

Complex | Medium | Easy

Description

The current trend of installing sophisticated electrical mechanisms and electronic devices in all areas responds to the new needs imposed by the manufacturers themselves, but also automatization is a consumer trend that has been increasing since many years. The result is a higher product complexity with more impacts in stages of the life cycle like material obtention or waste management, and an increasingly sedentary population with rising health problems.

Domestic activities require daily exercise that helps tone the body, so maintaining products with simple mechanical mechanisms, besides reducing cost and environmental impact, can create a positive effect on long-term health.

Companies good practices

- Alias Design
- Backapp
- GreyfoxDesign
- Labofa & Holmris
- MATTIAZZI
- Steelcase
- VS

EU strategies and legislations	Implications
Ecodesign for Sustainable Products Regulation (ESPR)	It will consider avoidance of technical solutions detrimental to reuse, upgrading, repair, maintenance, refurbishment, remanufacturing and recycling of products and components.

End-of-life phase

Recycling

Value Generation (Operations) | Key resources | Benefits | Complex | Medium | Easy

Description

The product recyclability will depend on the type of the materials that compose it, their composition, how are they treated or protected and the ability to separate them. Depending on these conditions, materials may enter the recycling chain with more or less successful results.

The quality of recycled materials must be sufficient to become raw materials for producing new products with the same purpose or the most possible similar one. Proper waste management can become a profitable business model if the materials obtained have value, and the design challenge to achieve an easy separation is as important as the capacity of the waste management system to treat them.

Companies good practices

- Auping
- IKEA
- KNOF
- Ljubljana
- Reuse Center
- M Sora
- Refunc
- Steelcase

EU strategies and legislations	Implications
Ecodesign for Sustainable Products Regulation (ESPR)	It will promote design for recycling, ease and quality of recycling as expressed through use of easily recyclable materials, safe, easy and non-destructive access to recyclable components and materials, etc. Also, it will promote the use or content of recycled materials and recovery of materials,

Materials labelling

Value Delivery (Experiences) | Relationship spaces | Value proposal | Complex | Medium | Easy

Description

Proper material labelling plays a crucial role in fostering recycling and effective waste management within a circular economy model. By clearly identifying the composition and recyclability of materials, labels enable consumers and waste processors to easily sort and recycle products. This minimizes contamination in recycling streams, enhances the quality of recycled materials, and ensures that valuable resources are efficiently recovered and reused.

Additionally, transparent labelling supports the traceability of materials throughout the product life cycle, promoting accountability and sustainability in production and consumption patterns. Ultimately, accurate and comprehensive material labelling is essential for closing the loop in a circular economy, reducing waste, and conserving natural resources.

Companies good practices

- neuwoodliving
- TRIPLE R
- VEPA
- Arper
- Ecomaison
- Foscarini
- Lago

EU strategies and legislations	Implications
Ecodesign for Sustainable Products Regulation (ESPR)	It will define information requirements for some products, through product labels and digital product passport
Green claims Directive	It will fix the rules for using ecolabels to avoid greenwashing
Empowering consumers for the green transition – Directive	It will limit unfair commercial practices that mislead consumers, including misleading environmental or social claims

Product take-back

Description

The new "take-back" model of production and consumption extends the product's life through reuse, either entirely or some of its component parts or materials, allowing the manufacturer to control the life cycle from the beginning to the end and increasing the possibilities of remanufacturing or recycling.

To achieve this, a business model focused on production and a recovery service must be implemented. In addition to reducing environmental impact, companies achieve a stronger relationship with their customers, something that at the end is benefiting them.

Extended Producer Responsibility (EPR) is crucial in take-back systems to enhance the environmental impacts of products and services. By mandating that producers are accountable for the entire life cycle of their products, including post-consumer waste management, EPR ensures that products are designed with sustainability in mind. This responsibility incentivizes producers to minimize waste, enhance recyclability, and reduce environmental harm, ultimately fostering a circular economy and promoting sustainable consumption and production practices.

Companies good practices

- Ahrend
- Balliu
- DESKO
- FICTION FACTORY
- Finline Furniture
- Fora Form
- GABRIEL
- Steelcase
- VALUMAT

EU strategies and legislations	Implications
Waste Framework Directive	It could fix limitations for furniture wastes in the future, including an Extended Producer Responsibility scheme for these products.

Remanufacturing

Description

Remanufacturing is focused on the repair and restoration of specific components so that they can be used in further products. It involves recovering used parts and refurbishing them to meet original equipment manufacturer (OEM) standards. This ensures that the remanufactured components function as effectively as new ones, allowing them to be reintegrated into the production cycle of new or existing products. This process not only extends the life of components but also contributes critically to resource efficiency and sustainability within a circular economy. When the manufacturer can recover products that have already reached the end of their useful life, all of them or some of their components can be repaired or modified to obtain new versions with a commercial guarantee.

In this industrial process, the manufacturer can achieve results with the same quality as the initial products or even higher if they choose to update them.

Companies good practices

- ABSOTEC - ABSORCIÓN ACÚSTICA
- AHREND
- Arper Spa
- Davies Office
- Gispen
- KAVE HOME
- Livetime
- ORANGEBOX
- Rype office

EU strategies and legislations	Implications
Ecodesign for Sustainable Prod-ucts Regulation (ESPR)	It will promote ease of upgrading, reuse, remanufacturing and refurbishment of products and components.

Reusability

Value Delivery (Experiences) | Stakeholders | Value proposal | Complex | Medium | Easy

Description

Through a "take-back" business model, the manufacturer can design a strategy focused on the object's or some components reuse, promoting the extension of its useful life with a second-hand sales system. To do this, it must have a department with the ability to check quality and clean, repair or change components as needed.

The reuse and reintroduction of fully functional products into the supply chain, with or without prior repair, is one of the most important strategies of the circular economy, and one that yields significant environmental benefits. Many companies in the furniture sector are realizing that foregoing this secondary market meant a loss of revenue, and they are beginning to offer a secondary market for their own products once repurchased from the original buyer, or through models based on renting or leasing as seen in sectors such as automotive.

Preparing for reuse can be profitable for the company, while promoting circularity among the population as they understand that product life can be extended.

Companies good practices

- AUB - Adopte un Bureau
- COR
- DEESUP
- IKEA
- KNOF
- M Sora
- MILLERKNOLL
- MILLIKEN
- NONES FALEGNAMERIA
- OKA office furniture
- REDO SGR
- Rewood srl
- Slettvoll
- SPAZIO META
- Steelcase
- Venaturae

EU strategies and legislations	Implications
Ecodesign for Sustainable Prod-ucts Regulation (ESPR)	It will promote ease of upgrading, reuse, remanufacturing and refurbishment of products and components.

Local composting

Value Generation (Operations) | Key resources | Value proposal | Complex | Medium | Easy

Description

Compostable materials have the ability to degrade biologically completely in a relatively short period of time without generating toxic waste. Obtaining a compost rich in organic matter can be ideal for improving soil nutrients and being a resource directly accessible to the users themselves. It is possible to reduce the synthetic mineral fertilizers taking care of the soil structure and properties.

It's important to consider that ensuring proper composting involves eliminating a range of toxins that cannot come into contact with the soil, so materials need to have a healthy composition to ensure a proper reintroduction in the biological cycle. It's also crucial to identify and separate compostable and biodegradable materials correctly from other waste fractions, and to have industrial-scale facilities for treating these materials. However, such facilities are not available in all countries or regions across the continent.

It is recommended to close the circle with this process when the materials are no longer reusable or remanufactured, so as it happens with recycling in the technological cycle, it's the last option after having discarded other strategies.

Companies good practices

- Agoprene
- Andreuworld
- Arper
- CUMELLAS
- iForm
- Molo Design
- Prowl Studio
- PULP-TEC
- Søuld
- Steelcase
- Zanotta

9 regulations

The European Green Deal is the EU's plan to tackle three interrelated crises - climate change, biodiversity loss, and pollution.
Based on this plan, the EU will:

- become climate-neutral by 2050;
- protect human life, animals and plants, by cutting pollution;
- help companies become world leaders in clean products and technologies; and
- help ensure a just and inclusive transition.

Since the release of the European Green Deal in 2019 and the Circular Economy Action Plan in 2020, the EU has developed and is still developing a set of policies and measures to drive investments and efforts towards a sustainable, just and inclusive transition.
The most relevant **strategies** and **legislative actions** associated with the EU Green Deal and other sustainability EU policies for the furniture sector are presented and analysed below, specifically the following ones:

- Ecodesign for Sustainable Products Regulation (ESPR)
- Deforestation free products Regulation (EUDR)
- Empowering consumers for the green transition – Directive
- Green claims Directive
- Right-to-repair (or R2R) Directive
- Waste Framework Directive - Revision
- Packaging and packaging waste - Regulation
- Taxonomy Regulation
- Green Public Procurement criteria
- Corporate Sustainability Reporting Directive (CSRD)
- The Chemicals Strategy

The above initiatives have been the result of the mandate of the European institutions for the period 2019-2024 and we are now at the beginning of the new mandate 2024-2029. The President of the European Commission, Ursula von der Leyen, already pointed out in her speech after her re-election some of the commitments of the European Commission for the new period: i) full implementation of the legal framework arising from the European Green Deal; ii) promotion of a new Clean Industrial Deal (decarbonisation and industrial competitiveness); iii) development of a new Circular Economy Law; and iv) review and simplification of REACH. These commitments are aligned with the political priorities of the EU agreed in the Strategic Agenda 2024-2029 adopted by the European Council in June 2024. Therefore, a new mandate of the European Commission 2024-2029 is foreseen focused on decarbonisation and the Circular Economy as key levers for business competitiveness.

Most relevant strategies and legislative actions associated with the EU Green Deal and other sustainability EU policies.

Ecodesign for Sustainable Products Regulation (ESPR)

Regulation (EU) 2024/1781 **Adopted**

Reference: Regulation (EU) 2024/1781 of the European Parliament and of the Council of 13 June 2024 establishing a framework for the setting of ecodesign requirements for sustainable products, amending Directive (EU) 2020/1828 and Regulation (EU) 2023/1542 and repealing Directive 2009/125/EC.

Status: Adopted – June 2024
The Commission work plan with product priorities is expected to be published at the latest in spring 2025.

Summary

This Regulation establishes a framework to improve the environmental sustainability of products and to ensure free movement in the internal market (EU) by setting ecodesign requirements that products shall fulfil to be placed on the market or put into service. Those ecodesign requirements, which shall be further

elaborated by the Commission in delegated acts, relate to:

a. product durability and reliability;
b. product reusability;
c. product upgradability, reparability, maintenance and refurbishment;
d. the presence of substances of concern in products;
e. product energy and resource efficiency;
f. recycled content in products;
g. product remanufacturing and recycling;
h. products' carbon and environmental footprints;
i. products' expected generation of waste materials.

This Regulation also establishes a Digital Product Passport (DPP), provides for the setting of mandatory green public procurement criteria and creates a framework to prevent unsold consumer products from being destroyed.

Impact on furniture companies

Furniture products are considered a relevant family of products to be regulated by ecodesign requirements, according to the Ecodesign for Sustainable Products Regulation - preliminary study on new product priorities (JRC, 2023).
According to this study, furniture exhibited a high improvement potential in terms of waste generation and lifetime extension, which could be improved by performance requirements on design for durability, design for reliability (e.g. resistance to stress or weathering), design for disassembly, design for refurbishing and/or recyclability, availability of spare parts and mandatory minimum recycled content materials. These circularity measures have the potential to extend the lifetime of the product or its component, potentially saving on new resources, and therefore having an effect on other categories such as air, soil and biodiversity.
The specific ecodesign requirements will be published in a specific delegated act, which will imply technical specifications, but also, information requirements. If these requirements are not fulfilled, the product will not be able to be sold in EU (not possible to include the CE marking).
Therefore, the manufacturers will have to guarantee that these ecodesign requirements are fulfilled which could imply changes in the manufacturing process, changes in the product design or changes in the used materials.
The requirements will be also associated with the Digital Product Passport. The specific information to be included will be specified in the delegated act, but it will require the collection and management of the information in the supply chain, the assessment of the environmental sustainability of products, the definition of an associated website to present the information, the incorporation in the product of the system to access to this information (e.g. QR code), etc.
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Deforestation free products Regulation (EUDR)

Regulation (EU) 2023/1115 **Adopted**

Reference: Regulation (EU) 2023/1115 of the European Parliament and of the Council of 31 May 2023 on the making available on the Union market and the export from the Union of certain commodities and products associated with deforestation and forest degradation and repealing Regulation (EU) No 995/2010.

Status: Adopted - June 2023
The regulation enters into application - December 2024 and for micro and small enterprises in June 2025. (Note: the European Commission has requested a 12-month postponement of its application).

Summary

This Regulation lays down rules regarding the placing and making available on the EU market as well as the export from the Union of relevant products, as listed in Annex I, that contain, have been fed with or have been made using relevant commodities, namely cattle, cocoa, coffee, oil palm, rubber, soya and wood.

Annex I includes for example wooden furniture, and parts thereof, seats, etc.
Under the Regulation, any operator or trader who places these commodities on the EU market, or exports from it, must be able to prove that the products do not originate from recently deforested land or have contributed to forest degradation.

Impact on furniture companies

Relevant commodities and relevant products shall not be placed or made available on the market or exported, unless all the following conditions are fulfilled:
a. they are deforestation-free;

b. they have been produced in accordance with the relevant legislation of the country of production; and
c. (they are covered by a due diligence statement, which includes collection of required information, risk assessment measures and risk mitigation measures.

Operators shall establish and keep up to date a framework of procedures and measures to ensure that the relevant products they place on the market or export comply these requirements (due diligence system).

Operators shall communicate to operators and to traders further down the supply chain of the relevant products they placed on the market or exported all information necessary to demonstrate that due diligence was exercised and that no or only a negligible risk was found, including the reference numbers of the due diligence statements associated with those products.

The obligations for SME traders are lower, but they shall collect and keep the required information about the products they intend to make available on the market.

Empowering consumers for the green transition – Directive

Directive (EU) 2024/825 **Adopted**

Reference: Directive (EU) 2024/825 as regards empowering consumers for the green transition through better protection against unfair practices and through better information.

Status: Adopted - March 2024

Summary

The Directive specifies rules to tackle unfair commercial practices that mislead consumers and prevent them from making sustainable consumption choices, such as practices associated with the early obsolescence of goods, misleading environmental claims ('greenwashing'), misleading information about the social characteristics of products or traders' businesses, or non-transparent and non-credible sustainability labels. Those rules will enable competent national bodies to effectively address such practices.

Main rules of the Directive:

- Consumers would have to be informed which products are more durable and reparable. Environmental and social impact, durability and repairability would be added to the list of product characteristics about which traders are forbidden to mislead consumers;
- Traders providing a service that compares sustainability of products would be required to disclose information on the method of comparison, the products that are being compared and suppliers of the products or risk being found to be misleading consumers by means of omission of material information;
- Ten new commercial practices would be added to the list of commercial practices that banned in all circumstances, including displaying a sustainability label that is not based on a certification scheme or not established by public authorities; making generic environmental claims; presenting requirements imposed by law on all products as a distinctive feature of a trader's offer; omitting to inform the consumer about a feature of a product that limits its durability; false claims about durability of a product; false claims about repairability of a product; persuading the consumer to replace a product earlier than necessary for technical reasons;
- When buying products, consumers would have to be informed that the producer offers a commercial guarantee of durability longer than the current two-year legal guarantee, if that is the case. Consumers would also have to be provided with a repairability score, if a repairability score is already established for that product under EU law, or information about the availability of spare parts and user and repair manual, if the producer has made such information available.

Impact on furniture companies

Furniture products, as other products in the EU market, are affected by this directive. Therefore, furniture manufacturers and traders should consider these rules when they inform to the consumers about the environmental characteristics of products, the associated guarantee period or reparation options.

The nowadays used sustainability labels or sustainability assertions (e.g. durability or environmental impact, etc.) should be reviewed to verify that they comply with these new rules.

Green Claims Directive

Directive (EU) | Proposal

Reference: Proposal for a Directive of the European Parliament and of the Council on substantiation and communication of explicit environmental claims (Green Claims Directive) / COM(2023) 166 final.

Status: Proposal - March 2023
The Council's general approach adopted in June 2024 will form the basis for negotiations with the European Parliament on the final shape of the Directive. Negotiations are expected to begin in the new legislative cycle.

Summary

This proposal aims to make green claims reliable, comparable and verifiable across the EU; to protect consumers from greenwashing; to contribute to creating a circular and green EU economy by enabling consumers to make informed purchasing decisions and to help establish a level playing field when it comes to environmental performance of products.
For this, traders have to carry out an assessment to substantiate explicit environmental claims, which has to comply certain requirements (e.g. evidences, information, third party verification, etc.).
The assessment of environmental performance of the product should be based on a life-cycle perspective, and done using approved methods or standards. Comparative assertions are also regulated and limited to certain circumstances.
Only environmental labels awarded under environmental labelling schemes established under Union law may present a rating or score of a product (or trader) based on an aggregated indicator of environmental impacts of a product (or trader). These environmental labels and labelling schemes should fulfil certain requirements (e.g. verification process, etc.).

Impact on furniture companies

This Directive is relevant for those furniture companies that make voluntary environmental claims about their products. These claims will be limited and it will be necessary to justify them using standards or recognised schemes.
Very few environmental labels will be accepted and approved by the EU. One example of accepted label would be the European Ecolabel, and any future review of EU Ecolabel Criteria should be in line with this Directive on green claims. In the case of furniture, the current criteria have been prolonged until 31 December 2026.

Right-to-repair (or R2R) Directive

Directive (EU) 2024/1799 | Adopted

Reference: Directive (EU) 2024/1799 of the European Parliament and of the Council of 13 June 2024 on common rules promoting the repair of goods and amending Regulation (EU) 2017/2394 and Directives (EU) 2019/771 and (EU) 2020/1828.

Status: Adopted - July 2024

Summary

This Directive lays down common rules promoting the repair of goods, with a view to contributing to the proper functioning of the internal (EU) market, while providing for a high level of consumer and environmental protection.
It applies to the repair of goods purchased by consumers in the event of a defect of the goods that occurs or becomes apparent outside the liability of the seller.
The proposal introduces an amendment to the legal guarantee framework regulated by the Sale of Goods Directive, prioritising repair as a remedy for non-conformity of goods whenever repair is cheaper or as costly as replacement.
The proposal presents several measures to facilitate and encourage repair and reuse of goods, such as obligation to repair goods to which reparability requirements under Union legal acts apply; Informing consumers about producers' repair obligation; Online national repair platform; a European Repair Information Form and a voluntary European quality standard for repair services.

Impact on furniture companies

The obligations of this Directive will apply to products for which repairability requirements already exist in Union law (mainly energy related products under the Ecodesign Directive). However, the list of such products can be extended over time, for example for products covered by Ecodesign for Sustainable Products Regulation (ESPR), in which furniture is considered as a priority.
If it is the case, the producer (authorised representative or importer) shall guarantee to the consumer the reparation of the product, if it possible this reparation.
Also, the producers shall ensure that independent repairers have access to spare parts and repair-related information and tools.
Producers have to inform consumers of their obligation to repair and provide information on the repair services in an easily accessible, clear and comprehensible manner (e.g. through an online platform).

Waste Framework Directive - Revision

Directive (EU) | Proposal

Reference: Proposal for a Directive of the European Parliament and of the Council amending Directive 2008/98/EC on waste / COM(2023) 420 final

Status: Proposal - July 2023

Summary

The proposal to amend the Waste Framework Directive focuses on two resource intensive sectors: textiles and food, with the following general objectives:

- To reduce environmental and climate impacts, increase environment quality and improve public health associated with textiles waste management in line with the waste hierarchy,
- To reduce the environmental and climate impacts of food systems associated with food waste generation. Preventing food waste would also contribute to food security. It would mean EU countries would have to reduce food waste by 10 % in processing and manufacturing, and by 30 % per capita, jointly at retail and consumption level, by 2030.

The proposal also introduces Extended Producer Responsibility (EPR) requirements for the textiles sector. These schemes would have to cover the costs of collecting textiles, shoes and textile-related products for re-use or recycling, along with transport and sorting, as well as supporting research and development to improve the sorting and recycling processes.

Impact on furniture companies

The proposal considers as textile-related articles, among others, "other furnishing articles, excluding those of heading 9404", according to CN code.
This excludes articles of bedding and similar furnishing (e.g. quilts, eiderdowns, cushions, pouffes and pillows) fitted with springs or stuffed or internally fitted with any material or of cellular rubber or plastics, whether or not covered.
It is not yet clear if mattresses will fall or not under the scope of this review. The European Parliament has proposed including mattresses (primarily composed of textiles) in the obligation for Member States to implement Extended Producer Responsibility (EPR) schemes within 30 months of the directive's entry into force. However, mattresses are considered out of the scope in the Commission's impact assessment as well as in the Council General Approach.
On the other hand, it fixes the bases of an Extended Producer Responsibility (EPR) scheme for textiles, which would be similar to future EPR schemes (e.g. furniture).

Packaging and packaging waste - Regulation

Regulation (EU) | Proposal

Reference: Proposal for a Regulation of the European Parliament and of the Council on packaging and packaging waste, amending Regulation (EU) 2019/1020 and Directive (EU) 2019/904, and repealing Directive 94/62/EC / COM(2022) 677 final.

Status: Proposal - November 2022
The European Parliament adopted the final text in Plenary on April 24th. Afterwards, the legal and translation services will go through the text, leading to its final adoption by the Council, probably in Q4 of 2024.

Summary

New EU rules on packaging cover all types of packaging and packaging waste placed on the EU market. This means all materials, and packaging including industrial, commercial, household and other sectors.
These rules regulate what kind of packaging can be placed on the EU market, as well as packaging waste management and packaging waste prevention measures. All packaging placed on the EU market has to comply with essential requirements related to its manufacturing, composition, and reusable or recoverable nature.
Among other rules, by end of 2024, EU countries should ensure that producer responsibility schemes are established for all packaging. The Directive also sets specific targets for recycling by 2025 and 2030.
The proposed regulation aims to prevent the generation of packaging waste, reducing it in quantity, and promoting reuse and refill, to ensure that all packaging on the EU market will be recyclable in an economically viable way by 2030 and to increase the use of recycled plastics in packaging.

Impact on furniture companies

The regulation will reduce the problems associated with the different sustainability and labelling requirements on the packaging in different EU countries.
Furniture companies should guarantee that they use packaging that comply with the regulation requirements, for example on the packaging material (e.g. substances content, recyclability, recycled content, etc.), the adequate labelling, the minimum weight and volume of packaging, the possible use of reusable packaging or the maximum ratio of empty space in the packaging in relation to the packaged product(s).

Taxonomy Regulation

Regulation (EU) 2020/852 | Adopted

Reference: Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088.
Commission Delegated Regulation (EU) 2023/2486 of 27 June 2023 supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council.

Status: Regulation adopted - June 2020
Delegated Act adopted - November 2023

Summary

The taxonomy is a classification system that defines criteria for economic activities that are aligned with a net zero trajectory by 2050 and the broader environmental goals other than climate.
The EU taxonomy allows financial and non-financial companies to share a common definition of economic activities that can be considered environmentally sustainable.
It establishes the basis for the EU taxonomy by setting out the 4 overarching conditions that an economic activity has to meet in order to qualify as environmentally sustainable.

The Taxonomy Regulation establishes six climate and environmental objectives:

1. Climate change mitigation
2. Climate change adaptation
3. The sustainable use and protection of water and marine resources
4. The transition to a circular economy
5. Pollution prevention and control
6. The protection and restoration of biodiversity and ecosystems.

Impact on furniture companies

The economic activity of Manufacture of Furniture (C31) is associated with the following services:

- Repair, refurbishment and remanufacturing
- Sale of spare parts
- Preparation for re-use of end-of-life products and product components
- Sale of second-hand goods
- Product-as-a-service and other circular use- and result-oriented service models
- Marketplace for the trade of second-hand goods for reuse

For each of them, the delegated act indicates "technical screening criteria", which have to be accomplished to be considered as environmentally sustainable, and a sustainable contribution to the transition to a circular economy.
If the activity is considered as environmentally sustainable, the access to financial support could facilitated (e.g. loans, external funding, etc.).

Green Public Procurement criteria

Voluntary instrument | Under revision

Reference: Public procurement for a better environment - Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - COM(2008) 400 final
Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement and repealing Directive 2004/18/EC

Status: The revision of furniture criteria has been delayed for ensuring consistency with ESPR and other initiatives.

Summary

The European Commission (EC) has been developing voluntary GPP criteria for several product groups, including furniture products.
Furthermore, following the adoption of the 2020 Circular Economy Action Plan, the Commission is proposing minimum mandatory Green Public Procurement - GPP criteria and targets in sectoral legislation and phase in compulsory reporting to monitor its uptake. In addition, it undertakes to continue to support capacity building through guidance, training and dissemination of good practices.

Relevant publications:

1. Revision of the EU Green Public Procurement (GPP) criteria for Furniture / JRC (2017)
2. Public Procurement for a Circular Economy. Good practice and guidance / DG Environment - EC (2017)

Impact on furniture companies

In this publication "Revision of the EU Green Public Procurement (GPP) criteria for Furniture / JRC (2017)", the criteria are split into three broad sections depending on whether the subject matter of the contract is: a refurbishment service for existing used furniture (A.), the procurement of new furniture items (B.) or the procurement of furniture end-of-life services (C.).
It should be borne in mind that furniture items which lie within the scope of the product group can vary substantially in nature and in the types of materials used. For this reason, a number of criteria are accompanied by conditional clauses which state under what circumstances these criteria should be considered as relevant enough to include in the invitation to tender.
These criteria are relevant for public tenders, and relevant for furniture manufacturers which participate on them.
In any case, despite not participating in these tenders, the furniture manufacturer and designer could take them into account when design and manufacture new products, in order to be aligned with these criteria.

Corporate Sustainability Reporting Directive (CSRD)

Directive (EU) 2022/2464 **Adopted**

Reference: Directive (EU) 2022/2464 amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU, as regards corporate sustainability reporting.
Commission Delegated Regulation (EU) 2023/2772 of 31 July 2023 supplementing Directive 2013/34/EU of the European Parliament and of the Council as regards sustainability reporting standards.

Status: Directive adopted - December 2022
Delegated Regulation adopted - December 2023

Summary

The Directive requires all large companies and all listed companies (except listed micro-enterprises) to disclose information on what they see as the risks and opportunities arising from social and environmental issues, and on the impact of their activities on people and the environment.

This helps investors, civil society organisations, consumers and other stakeholders to evaluate the sustainability performance of companies.
Companies subject to the CSRD will have to report according to European Sustainability Reporting Standards (ESRS).

Impact on furniture companies

The rules will start applying between 2024 and 2028, as follows:

- From 1 January 2024 for large public-interest companies (with over 500 employees) already subject to the non-financial reporting directive, with reports due in 2025;
- From 1 January 2025 for large companies (with more than 250 employees and/or €40 million in turnover and/or €20 million in total assets) not presently subject to the non-financial reporting directive, with reports due in 2026;
- From 1 January 2026 for listed SMEs and other undertakings, with reports due in 2027. SMEs can opt-out until 2028.

European Sustainability Reporting Standards (ESRS) specify the information that an undertaking shall disclose about its material impacts, risks and opportunities in relation to environmental, social, and governance sustainability matters.

The European sustainability reporting standards (ESRS) are:

- ESRS 1 General requirements
- ESRS 2 General disclosures
- ESRS E1 Climate change
- ESRS E2 Pollution
- ESRS E3 Water and marine resources
- ESRS E4 Biodiversity and ecosystems
- ESRS E5 Resource use and circular economy
- ESRS S1 Own workforce
- ESRS S2 Workers in the value chain
- ESRS S3 Affected communities
- ESRS S4 Consumers and end-users
- ESRS G1 Business conduct

Companies should collect the required information to report according to these standards. This could include not only information about its own processes, but also information about their value chain.

The Chemicals Strategy

EU Strategy | Published

Reference: Chemicals Strategy for Sustainability - Towards a Toxic-Free Environment / COM(2020) 667 final

Status: Published - October 2020

Summary

It aims to ensuring that all chemicals are used more safely and sustainably, promoting that chemicals having a chronic effect for human health and the environment - substances of concern - are minimised and substituted as far as possible, and phasing out the most harmful ones for non-essential societal use, in particular in consumer products.

It defines actions to support innovation for safe and sustainable chemicals, strengthen the protection of human health and the environment, simplify and strengthen the legal framework on chemicals, build a comprehensive knowledge base to support evidence-based policy making, and set the example of sound management of chemicals globally.

Impact on furniture companies

The strategy includes the revision of the most relevant EU Chemicals regulations, mainly REACH and CLP Regulations.

Furniture manufacturing companies, as downstream users of regulated substances, should guarantee:

- the use of chemicals safely, implementing the operational conditions and risk management measures included in the safety data sheets provided by the supplier.
- inform the suppliers about the use of their chemicals, particularly if the uses are not covered in the received information, or the safety advice is not appropriate.
- If the use is not supported, the downstream user should substitute the substance with another substance which cover their conditions of use (with the same or another supplier).
- Inform the consumer, if some of these substances remains in the final product, on safe use of the product.

If the companies use materials, products or components, which could contain these regulated substances, they should guarantee that the supplied items fulfil these regulations (declaration of hazardous substances content, etc.).

The Commission Regulation (EU) 2023/1464 amending Annex XVII to Regulation (EC) No 1907/2006 (REACH) of the European Parliament and of the Council as regards formaldehyde and formaldehyde releasers, regulates intentionally added formaldehyde and formaldehyde releasing substances in wood-based articles and furniture, articles other than wood-based articles and furniture, as well of the interior of vehicles. Articles that do not comply with the limits of the Regulation will not be marketed after August 6, 2026.

It should also be mentioned that in the case of melamine the European Chemicals Agency (ECHA) is considering recommending this substance and four more for the REACH Authorisation List.

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