

ECODESIGN STRATEGIES

Trainer Handbook



VERDEinMED

Interreg
Euro-MED



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PREFACE

This document aims to develop a skilled workforce through knowledge sharing, fostering experienced professionals in the textile and clothing industry, with a focus on circular strategies and textile waste management. It is a key outcome of the VERDEinMED project, specifically Activity 1.3 – _Train the Trainers, which forms part of WP1: Reforming the Industry through Sustainable and Circular Practices. In particular, this document aligns with the theme “Ecodesign Strategies”, exploring innovative design approaches and strategies to minimise environmental impact and promote sustainability throughout product creation and the entire lifecycle. The information is organised as follows:

1. Introduction to ecodesign principles;
2. Sustainable material selection;
3. Design for durability and longevity;
4. Low-impact manufacturing processes;
5. Life cycle assessment and eco-labelling;
6. Case studies and best practices;
7. Conclusions.



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Introduction to Ecodesign Principles

Ecodesign is grounded in the recognition that design decisions have a decisive influence on a product's overall environmental performance. Numerous studies and policy documents consistently indicate that up to 80% of a product's environmental impacts are determined during the design phase, when key choices regarding materials, product architecture, manufacturing processes, usability, and end-of-life pathways are made (Figure 1).

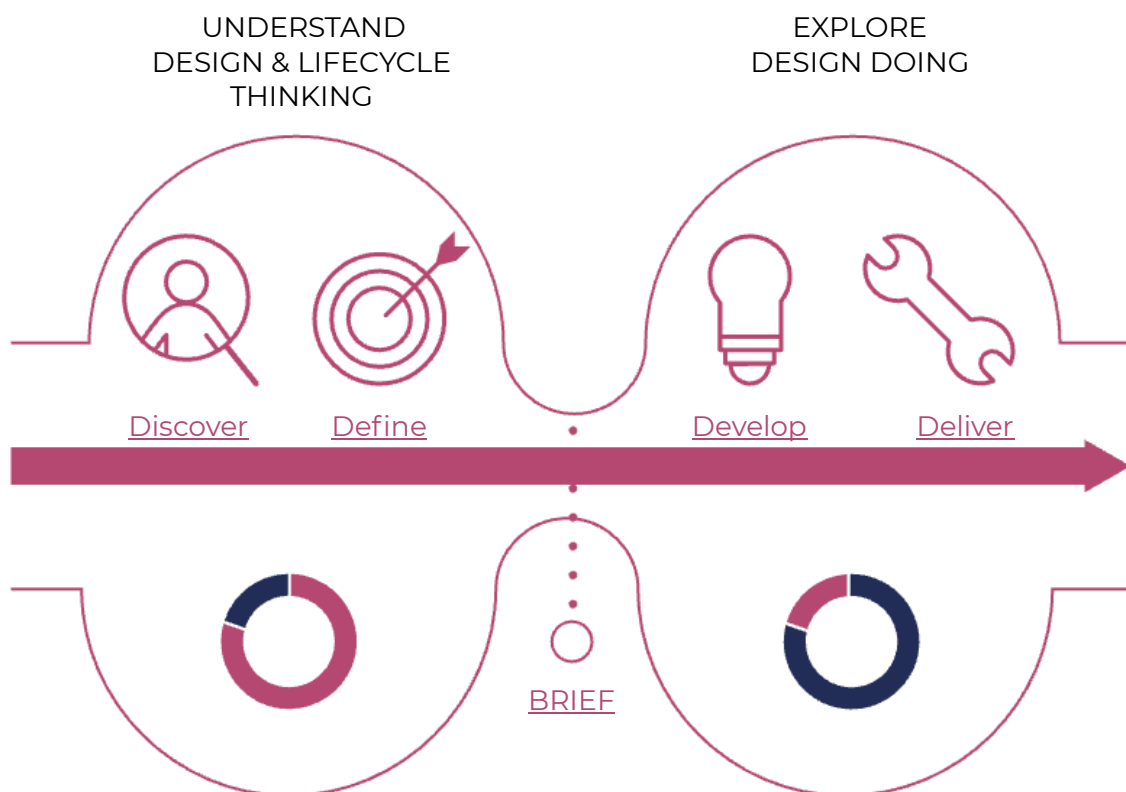
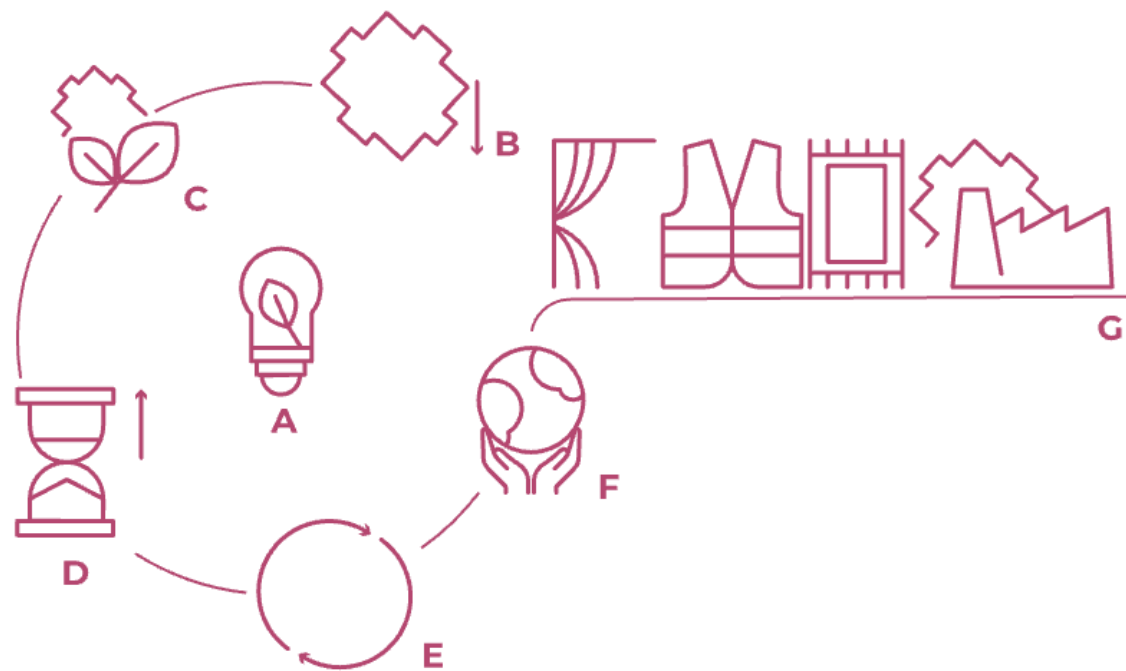


Figure 1 - Design process impact

In this context, ecodesign represents a shift from reactive environmental management towards anticipatory and preventive design practices (Figure 2). Rather than mitigating impacts after they occur, ecodesign integrates environmental criteria alongside functional, aesthetic, economic, and social requirements from the earliest stages of product development. This approach is particularly critical in the textile and apparel sector, which is characterised by complex global supply chains, intensive resource use, high production volumes, and short product lifespans. The sector is responsible for significant impacts related to climate change, water consumption, chemical pollution, and waste generation, making it a priority area for policy intervention and innovation.



- | | | | |
|----------|----------------------------|----------|--|
| A | Ecodesign | D | Increase of the useful life |
| B | Less materials | E | Easy recycling |
| C | More sustainable materials | F | Reduction of emissions and environmental impact |
| | | G | Sectors: home textiles; work clothes; carpets; textile companies |

Figure 2 - Ecodesign approach

Ecodesign aims to reduce environmental impacts across the entire product life cycle, including raw material extraction, fibre production, manufacturing, distribution, use, and end-of-life management. Importantly, it does so while maintaining or enhancing product quality, performance, and user value. Within the European policy framework, ecodesign is a cornerstone of Sustainable Consumption and Production (SCP) and of the transition towards a circular economy. The recently adopted EU Ecodesign for Sustainable Products Regulation (ESPR) extends ecodesign requirements beyond energy-related products to a broad range of physical goods, including textiles. It introduces binding requirements related to durability, reparability, recyclability, recycled content, and information transparency, notably through the Digital Product Passport.

Within this evolving regulatory and market landscape, ecodesign is no longer a niche or voluntary practice, but a strategic capability for companies. It enables organisations to anticipate regulatory compliance, reduce environmental and business risks, and unlock value through circular business models such as reuse, repair, remanufacturing, and recycling.

CORE PRINCIPLES OF ECODESIGN

Ecodesign is typically structured around a set of interrelated principles that guide decision-making throughout the product development process.

Ecodesign serves both strategic and operational functions, helping companies anticipate regulation, reduce risks and capture value from circular business opportunities.

LIFECYCLE THINKING	Holistic understanding of environmental impacts across the full product life cycle, from raw materials to end-of-life, to avoid burden shifting and target the most effective design interventions (e.g. materials, durability, use phase).
PREVENTIVE DESIGN	Reduce impacts at source by minimising material and energy use, eliminating hazardous substances and designing out waste and inefficiencies before production.
SYSTEMIC INTEGRATION	Align product design with circular value chains, responsible sourcing, ethical labour, and stakeholder collaboration, recognising that sustainability depends on system-level coordination.
DATA-DRIVEN IMPROVEMENT	Use measurable data and tools such as LCA and the Digital Product Passport to support evidence-based decisions, transparency, continuous improvement, and regulatory compliance.

Sustainable Material Selection

Material selection is one of the most influential determinants of a textile product's environmental, social, and economic performance. Scientific literature and European policy consistently highlight that fibre choice largely defines upstream impacts, including land use, water consumption, greenhouse gas emissions, chemical pollution, and biodiversity loss. In addition, material decisions strongly influence a product's durability, recyclability, and end-of-life pathways, making them central to circular economy strategies for textiles (Figure 3).

Within the European Green Deal and the EU Strategy for Sustainable and Circular Textiles, sustainable material selection is framed not as the identification of a single “best material”, but as a context-dependent, data-driven decision-making process. Designers are therefore encouraged to rely on structured evaluation criteria that balance environmental performance, circularity potential, social responsibility, and economic feasibility, rather than focusing on isolated material attributes or marketing claims.

ARTICLE 5 - ECODESIGN REQUIREMENTS



Figure 3 - Ecodesign requirements

Evaluation Criteria for Material Selection

ENVIRONMENTAL ASPECTS

RENEWABILITY AND RESOURCE INTENSITY

Preference should be given to fibres derived from renewable resources with lower input intensity, such as organic cotton, hemp, flax (linen), certified cellulosic fibres (e.g. FSC- or PEFC-certified viscose and lyocell), and recycled fibres.

Compared with conventional alternatives, these materials can significantly reduce pesticide use, fossil resource depletion, and energy demand, depending on production conditions and certification schemes.

POLLUTION AND EMISSIONS

A comprehensive assessment of pollution across the fibre life cycle is essential. Key indicators include greenhouse gas emissions, water consumption and scarcity, eutrophication, acidification, and chemical toxicity associated with fibre cultivation, polymer production, spinning, and finishing. The European Commission emphasises the need to reduce the use of hazardous chemicals in textiles in line with REACH and the Zero Pollution Action Plan, making chemical management a critical material selection criterion.

END-OF-LIFE COMPATIBILITY

Sustainable materials should be compatible with realistic end-of-life scenarios. This includes the capacity to biodegrade or be composted under appropriate conditions, or to re-enter established recycling streams. Importantly, biodegradability should not be assumed to be inherently beneficial; it must be assessed in relation to the availability of infrastructure, the risk of environmental leakage, and overall life cycle performance (EEA, 2022).

SOCIAL ASPECTS

Sustainable material selection also encompasses social and ethical dimensions across global supply chains. Designers and companies are expected to consider the following:

- Respect for labour rights, safe working conditions and fair wages throughout fibre production and processing stages.
- Impacts on local communities, including land use conflicts and access to water resources.
- Verification through credible third-party certifications such as GOTS, Fair Trade, OEKO-TEX®, and bluesign®, which provide assurance on environmental and social performance, though they should be complemented by broader due diligence processes

ECONOMIC ASPECTS

Economic viability is a necessary condition for the large-scale adoption of sustainable materials. Key factors include:

- Material cost and price volatility, particularly for bio-based and recycled fibres.
- Supply chain stability, traceability, and scalability in response to growing regulatory and market demand.
- Long-term value creation through improved brand resilience, regulatory compliance and reduced dependency on virgin resources, rather than short-term cost optimization alone.

Tools Supporting Material Decisions

To support informed and transparent material choices, designers increasingly rely on quantitative and qualitative decision-support tools, alignment with forthcoming Digital Product Passport requirements, and continuous improvement across product portfolios. These include:

- Life Cycle Assessment (LCA) software, such as SimaPro, GaBi, and OpenLCA, which enable comparative environmental impact assessments based on standardised methodologies (ISO 14040/44).
- The Higg Materials Sustainability Index (MSI), widely used in the apparel sector to screen and compare material impacts, while acknowledging ongoing methodological debates and the need for complementary LCA-based analysis.
- Textile Exchange Materials Market Report & Materials Benchmark, providing industry-wide data on global fibre volumes, recycled content, and certified versus conventional materials, supporting strategic sourcing, risk assessment, and the scaling of circular materials.

Material-Driven Circular Design

Enable circular product design by integrating material decisions that reduce waste, improve system efficiency, support circular value chains, and maintain or enhance functional performance. This includes:

- Reduce material losses by optimising pattern layout, cutting efficiency, and material use. Avoid unnecessary trims, coatings, and mixed components, and ensure production scraps can be recycled or reintegrated into material streams.
- Select materials that can be sourced, processed, and recycled within regional or near-regional supply chains. This reduces transport impacts, improves traceability, lowers supply risks, and aligns products with existing local infrastructure.
- Prioritise mono-material constructions to enable repair and recycling. Use fibre blends only when they deliver clear functional or durability benefits and do not compromise end-of-life options or circular value retention.

- Design garments so that components such as trims, fasteners, and accessories can be easily removed or replaced. Minimise permanent attachments and non-recyclable elements to enable repair, reuse, remanufacture, and textile-to-textile recycling.
- Prioritise advanced processing technologies, such as bio-based or low-impact dyeing, enzymatic treatments, and functional finishes with reduced chemical toxicity.

Design for Durability and Longevity

Extending product lifespan is widely recognised as one of the most effective strategies for reducing the environmental impacts of textile products. Scientific studies demonstrate that increasing the active use phase of garments significantly lowers their life cycle impacts by reducing the demand for virgin materials, energy, and water associated with replacement products. The European Commission similarly emphasises durability, repairability, and longevity as priority requirements under the EU Strategy for Sustainable and Circular Textiles and the Ecodesign for Sustainable Products Regulation (ESPR).

Ecodesign systematically integrates these elements to prevent premature waste generation and to shift textiles away from short-lived, disposable consumption models. Durability in this context is not limited to physical resistance but also encompasses functional and aesthetic performance, supported by repair systems and circular recovery pathways.

Physical Durability

Ensure that garments withstand repeated use and care.

- High-performance materials suited to garment function.
- Reinforcement of stress-prone areas (seams, closures, hems).
- Robust construction and stitching standards, adapted to garment category and expected use intensity.

Fit and Adaptability

Poor fit is a key driver of early disposal.

- Adjustable features (e.g. waistbands, extendable lengths, modular elements).
- Inclusive sizing systems based on diverse body data and transparent measurements.
- Design for alteration, supported by accessible repair or tailoring services.

Use-Phase Impact Reduction

The use phase often dominates life-cycle impacts.

- Promote low-temperature washing and air drying through care labels and digital information.
- Use materials that reduce laundering frequency (e.g. odour resistance, crease resistance).
- Support consumer education on care, repair, and prolonged use.

Reuse and Repair Models

Design garments that aim to remain in use.

- Easy access to repair points (buttons, seams, fasteners).

- Replaceable or modular components to extend functional life.
- Compatibility with reuse, resale, and refurbishment systems.

Design for Remanufacture and Recycling

At end-of-life, garments should enable material recovery.

- Minimising fibre blends and avoiding hard-to-recycle components.
- Prioritising mono-material constructions and detachable trims.
- Using recycled fibres and designing products as future feedstock for remanufacture or recycling.

Low-impact Manufacturing Processes

Manufacturing is a critical hotspot for environmental impacts in the textile sector, particularly in relation to waste generation, water use, chemical pollution, and greenhouse gas emissions. European policy and scientific studies highlight those significant reductions can be achieved through cleaner production, circular resource management, and energy transition measures embedded at both factory and supply-chain levels.

WASTE MINIMISATION AND INDUSTRIAL SYMBIOSIS

Reducing waste at source and retaining material value are core principles of circular manufacturing. These approaches minimise landfill and incineration while reducing demand for virgin raw materials. Key strategies include:

- Optimising cutting and production layouts to minimise offcuts and material losses.
- Recycling production scraps and establishing partnerships with fibre-to-fibre recyclers and other industries through industrial symbiosis.
- Implementing take-back schemes and circular logistics, enabling post-industrial and post-consumer textiles to re-enter material loops.

WATER CONSERVATION AND CHEMICAL MANAGEMENT

Textile pre-treatment, dyeing, and finishing are among the most water- and chemical-intensive industrial processes. Given the sector's high-water footprint, water efficiency and chemical management are increasingly considered baseline requirements. Priority interventions include:

- Water reuse and closed-loop systems integrated across production steps.

- Cleaner production technologies, such as low-liquor-ratio dyeing, digital printing, and enzymatic treatments.
- Substitution of hazardous substances with certified safer alternatives, in line with REACH, the EU Chemicals Strategy for Sustainability, and Zero Pollution objectives.

ENERGY EFFICIENCY AND EMISSION REDUCTION

According to the Greenhouse Gas Protocol, textile emissions occur across Scope 1, 2, and especially Scope 3, which often represents over 90% of total emissions. Key reduction measures include:

- Upgrading to energy-efficient machinery and implementing preventive maintenance programmes.
- Optimising heating, cooling, and lighting systems through automation and passive design solutions.
- Transitioning to renewable energy, including on-site solar generation and renewable electricity sourcing.
- Digitalisation of operations to improve efficiency and reduce resource use.
- These actions support alignment with EU climate targets and corporate decarbonisation strategies.

SUSTAINABLE TRANSPORTATION

Transport contributes to both Scope 1 and Scope 3 emissions and can be reduced through:

- Transitioning company fleets to electric or low-emission vehicles where feasible.
- Reducing travel demand through remote work and digital collaboration.
- Prioritising lower-impact transport modes, such as rail over air and sea over road, for logistics and business travel.

Product Impact and Transparency

Product impact and transparency tools enable designers, companies, and consumers to understand, compare, and improve the environmental performance of textile products. Within the EU policy framework, these tools support ecodesign, regulatory compliance, and informed decision-making throughout the value chain.

LIFE CYCLE ASSESSMENT (LCA)

LCA is a quantitative method used to evaluate environmental impacts across all life-cycle stages, following ISO 14040/14044 standards. It comprises four phases: goal and scope definition, life cycle inventory (LCI), life cycle impact assessment (LCIA), and interpretation.

LCA supports ecodesign by identifying environmental hotspots, comparing design alternatives, guiding material and process choices, and substantiating sustainability claims. In early design stages, streamlined or screening LCAs are commonly applied where data availability is limited.

ECO-LABELLING

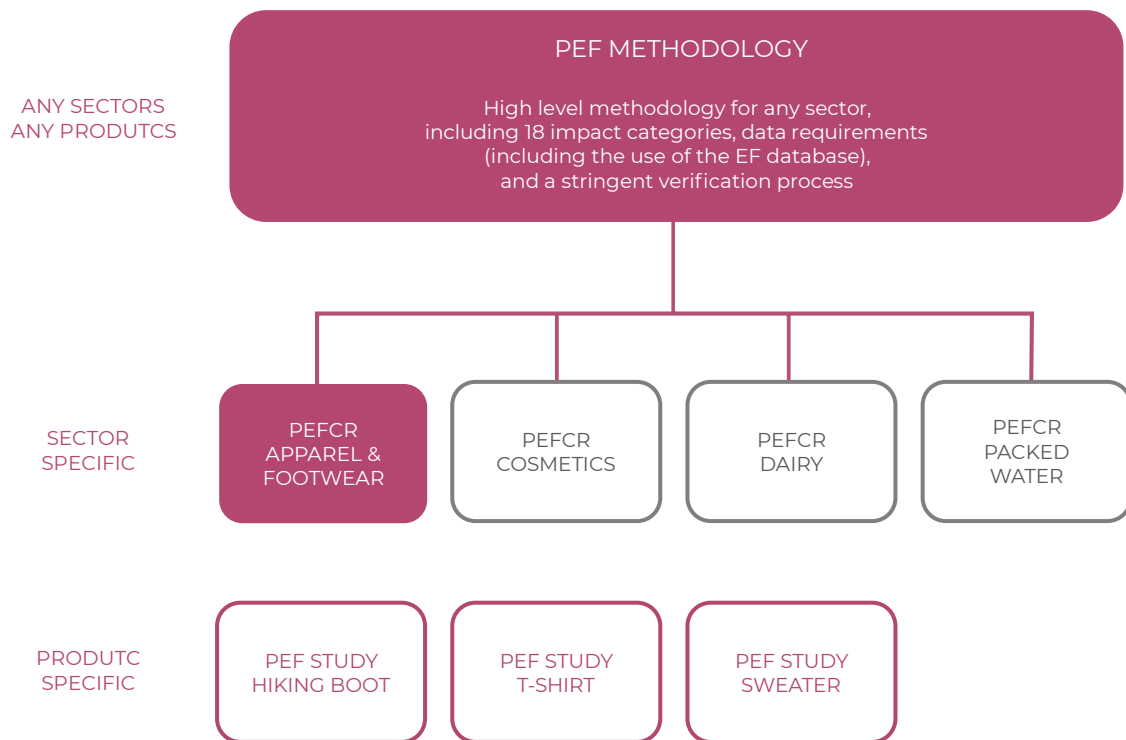
Eco-labels communicate verified environmental and chemical performance to consumers and professional buyers. They also incentivise manufacturers to adopt cleaner processes and ensure transparency across supply chains.

Key roles of eco-labelling include supporting purchasing decisions, enabling compliance with public procurement and retail requirements, and enhancing market positioning. Relevant schemes in the textile sector include the EU Ecolabel, GOTS, OEKO-TEX®, and bluesign®.

PRODUCT ENVIRONMENTAL FOOTPRINT (PEF) AND PEF CATEGORY RULES (PEFCR)

The Product Environmental Footprint (PEF) is the European Commission's harmonised LCA-based method for assessing and comparing the environmental performance of products. For textiles, the PEF Category Rules (PEFCR) for Apparel and Footwear define common assumptions, impact categories, and calculation rules to ensure comparability and credibility (Figure 4).

PEFCRs are expected to play a central role in substantiating environmental claims and supporting future regulatory and market requirements within the EU.



**Specific category rules complementing the PEF methodology, setting the rules for a detailed industry. About 30 PEFCRs exist to date.*

Figure 4 - Product Environmental Footprint (PEF) methodology, adapted from the European Union

DIGITAL PRODUCT PASSPORT (DPP)

The Digital Product Passport (DPP) is a key instrument under the Ecodesign for Sustainable Products Regulation (ESPR). It enables structured digital access to product information, including material composition, environmental performance, durability, reparability, and recycling instructions. DPPs support traceability, regulatory compliance, circular business models, and the flow of information across the value chain and to end users (Figure 5).

Further information is provided in the handbook Digital Innovations in Digital Solutions and Traceability.

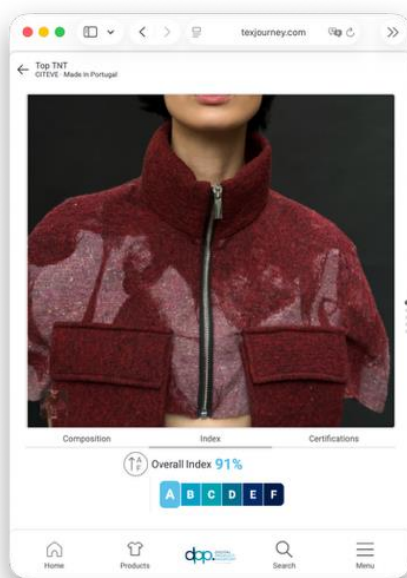


Figure 5 - CITEVE's Digital Product Passport

CONSUMER AWARENESS AND MARKET TRANSPARENCY

EU policy emphasises empowering consumers with reliable information to encourage purchasing behaviour towards more sustainable textile products, addressing fast fashion and overconsumption by making environmental impacts transparent and understandable. Clear and credible product information enables informed consumer choices and supports market demand for longer-lasting, circular products, contributing to reduced waste and lower environmental pressures from textile consumption.

Case Studies and Best Practices

Rethinking the System – Tools and Applications

CIRCULAR DESIGN TOOLKIT

The Circular Design Toolkit is a practical design support tool that helps companies and designers integrate circular economy principles into product, service, and system development. It is widely used in design-led organisations and EU-supported innovation programmes to structure circular thinking across early ideation, concept development, and implementation. By combining workshops, checklists, and assessment tools, it enables teams to identify circular opportunities, test scenarios, and embed sustainability into everyday design decisions, rather than treating it as a standalone activity.

KEY ACHIEVEMENTS	BEST PRACTICES
Improved integration of circular principles in early design phases.	Use structured circular workshops at concept stage
Clear identification of circular opportunities across the value chain.	Apply lifecycle-based mapping tools.
Stronger internal alignment on circular objectives	Use shared visual tools and common design language.

Website: <https://circulardesign.tools>

CIRCULAR STRATEGIES WHEEL

The Circular Strategies Wheel is a visual decision-support framework that structures the full range of circular economy strategies across a product's life cycle. It helps designers and organisations prioritise actions that retain the highest product and material value, such as durability, reuse, and repair, before considering lower-value strategies like recycling. The tool is frequently used in training, strategy development, and cross-functional workshops to guide decision-making and avoid a narrow focus on end-of-life solutions.

KEY ACHIEVEMENTS	BEST PRACTICES
Extended garment lifetime through reinforced design.	Prioritise “use longer” strategies before recycling.
Improved recyclability of products.	Design with mono-materials and detachable components.
Cross-department alignment on circular priorities .	Use the wheel as a shared decision-making framework.
Website: https://ddc.dk/vaerktoejer/tool-01-circular-strategies-wheel/	

Circular Products – Brand Practices

ISTO.

ISTO. is a menswear brand that integrates circular product design through material transparency, durability, and long-term use. The brand applies circular principles by limiting material complexity, favouring high-quality natural fibres, and designing timeless products intended to remain in use across multiple seasons. Circular design tools support the prioritisation of durability and responsible material sourcing over trend-driven design.

KEY ACHIEVEMENTS	BEST PRACTICES
Increased garment longevity.	Design timeless styles with high-quality, durable materials
Reduced material complexity.	Avoid unnecessary blends and focus on mono-materials
Improved transparency and trust.	Communicate material choices and care guidance clearly to consumers
Website: isto.pt	

Play Up

Play Up integrates circular design principles across children's wear by combining responsible material sourcing, durability, and recyclability. Using circular strategy frameworks, the brand prioritises natural and recycled fibres, designs for long use and reuse, and ensures products can be safely recycled at end-of-life. Circular tools support alignment between design, sourcing, and production teams, particularly in balancing product performance with circularity.

KEY ACHIEVEMENTS	BEST PRACTICES
Reduced environmental impact of materials.	Prioritise certified natural and recycled fibres.
Enhanced reuse potential.	Design durable garments suitable for multiple use cycles.
Improved end-of-life outcomes.	Align material choices with existing recycling systems.
Website: www.playupstore.com	

Conclusions

Some of the key points of Ecodesign Strategies are presented below:

- Ecodesign is a strategic and preventive approach that places design decisions at the core of environmental impact reduction, enabling companies to anticipate regulation, reduce risks, and drive circular innovation across the textile value chain.
- Material choice is a primary driver of environmental and social impacts in textiles and must be guided by data, life-cycle thinking, and circularity criteria rather than isolated attributes or claims.
- Circular product performance depends on integrating material decisions with product architecture, enabling waste reduction, repair, disassembly, and alignment with regional circular infrastructures from the design stage.
- Extending garment lifespan through durability, adaptability, and repairability is one of the most effective strategies to reduce environmental impacts and counter fast-fashion consumption patterns.
- Significant reductions in emissions, water use, chemicals, and waste can be achieved through cleaner production, industrial symbiosis, energy transition, and efficient logistics embedded across textile manufacturing systems.
- Tools such as LCA, eco-labelling, PEFCR, and the Digital Product Passport provide the foundation for credible impact assessment, regulatory compliance, and transparent communication across value chains.
- Empowering consumers with clear, reliable sustainability information is essential to shift demand towards longer-lasting, circular textile products and to reduce waste and environmental pressures driven by overconsumption.



PreVEnting and ReDucing the tExtiles waste mountain in the MED area

Project overview

The VERDEinMED project is an initiative funded by the Interreg Euro-MED programme to promote the circular economy in the textile sector. VERDEinMED is a thematic project that will provide a support service to boost circularity in the textile value chain for businesses, consumers, policy makers and academia.

The project is part of the Innovative Sustainable Economy mission of the Euro-MED programme, which seeks cooperation between Mediterranean countries to promote smarter and greener business models. VERDEinMED project brings together 10 partners and 15 associated entities from Greece, Spain, Portugal, Italy, Slovenia, North Macedonia, Bulgaria, Tunisia, Turkey, Belgium and Lebanon



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-Corporación Tecnológica de Andalucá.

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