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Toolkit Zone 3 Practical Modules

Materials, Eco-Design & Circularity

Green and Circular Economy in Business by
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Chapter 13 - Materials, Eco-Design & Circularity (LCA-lite)

Sustainability in SMEs is often discussed in terms of energy, emissions or reporting. Yet for many businesses, the biggest environmental and cost impacts sit in the materials they buy, how products are designed, and what happens to those products at end of life. Decisions taken at design stage largely determine resource use, waste generation and circular opportunities later on. The circular economy agenda and new EU policies on sustainable products increasingly make this a strategic issue for SMEs, not only a technical one.

The circular economy is not a niche idea. It is central to European environmental and industrial policy and is recognised globally to cut greenhouse gas emissions and resource use while opening new business opportunities. The Ellen MacArthur Foundation estimates that applying circular economy strategies in just five material-intensive sectors could eliminate almost half of remaining emissions from goods production by 2050. At the same time, EU initiatives on sustainable products and packaging are pushing manufacturers and suppliers, including SMEs, to improve durability, reparability, recyclability and recycled content.

For SMEs, all of this can feel abstract or overwhelming. The aim of this module is to make it concrete. It focuses on three practical levels: designing better products and packaging, using materials more intelligently, and applying a simplified life-cycle perspective that fits limited SME capacities.

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13.1 Why materials and design matter for SMEs

In traditional linear models, value is created by selling as many products as possible and replacing them frequently. Resources are extracted, transformed into products, used briefly, then discarded. The costs of resource depletion, waste and emissions are largely externalised. The circular economy challenges this logic by trying to keep materials at their highest value for as long as possible through durability, repair, reuse, remanufacturing and high-quality recycling.

For SMEs, the implications are both environmental and economic:

- Materials and components are often among the largest cost items in production. Using less material, extending product life or reusing components can improve margins directly.
- Waste disposal, especially of hazardous or bulky materials, is a non-trivial cost that can be reduced by prevention, reuse and recycling.

- Customers, especially business and public-sector clients, increasingly look at the environmental profile of products, including material choices and packaging.
- Regulations on eco-design, packaging and waste are tightening. Designing with these requirements in mind avoids future compliance shocks.

Empirical work on European SMEs shows that those adopting eco-design and circular practices tend to achieve “factor four” or higher gains in resource productivity, meaning they can deliver the same function with a fraction of the material, energy and waste of conventional competitors. Case studies compiled by Eurofound highlight small firms that, by rethinking product design and material flows, reduced waste costs, opened niche markets and strengthened local supplier relationships.

From a managerial perspective, materials and design are therefore not a side issue, but a lever for cost reduction, innovation and compliance preparedness.

13.2 Eco-design as everyday management practice

Eco-design means systematically integrating environmental considerations into product and service design alongside cost, quality and aesthetics. ISO 14006 provides formal guidance on how to embed eco-design into an existing environmental management system, but its core ideas can be applied by SMEs even without formal certification: understand environmental aspects of products, set eco-objectives, and integrate them into design routines and criteria.

Recent European projects on sustainable product development in SMEs underline that eco-design is as much a management issue as a technical one. The CURIOST project, for example, worked with SMEs and small mid-caps in several manufacturing sectors and found that companies evolve through different “transformation levels”:

- Level 0: no systematic consideration of sustainability in product development; occasional ad hoc improvements.
- Level 1: compliance-driven; environmental aspects considered only to meet regulations or customer checklists.
- Level 2: efficiency-driven; structured efforts to reduce material and energy use, supported by simple tools and targets.
- Level 3: innovation-driven; sustainability becomes a driver of differentiation and new business models.

Many SMEs sit around level 1 or 2. Moving towards level 3 does not mean becoming a research lab. It means formalising a few practical elements:

- Clear eco-design objectives, such as reducing material use per unit, increasing recycled content or extending product lifetime.

- Simple design rules, for example “avoid mixed materials that cannot be separated”, “prefer easily recyclable plastics and clear labelling”, or “design joints that can be disassembled with basic tools”.
- Early involvement of production, purchasing and service staff in design discussions to ensure circular ideas are feasible in practice.

The CURIOST work also points out that eco-design is easier when supported by sector-specific examples, because SMEs often lack capacity for generic LCA studies and need concrete patterns relevant to their products.

In practice, eco-design can be integrated into existing gates in the development process. For example, when approving a new product concept, managers can ask:

- How much material is required per functional unit, and can it be reduced?
- How easy will it be to maintain, repair or upgrade this product?
- What is the expected lifetime, and can it be extended?
- What happens at end of life, and can high-quality recycling or reuse be enabled?

These questions do not require a full LCA model, but they do require consistent attention. Over time, the answers become part of the company’s design DNA.

13.3 Life-cycle thinking in an “LCA-lite” mode

Life-cycle assessment (LCA) is a well-established method for quantifying environmental impacts of products from raw material extraction to end of life. However, full LCAs are often too complex and resource-intensive for SMEs to apply routinely. Recognising this, the UNEP Life Cycle Initiative and others have promoted more pragmatic “hotspot” approaches that help businesses focus on the stages and issues that matter most without exhaustive modelling.

An “LCA-lite” approach for SMEs typically involves four steps:

1. Map the life cycle in plain language: list the main stages (raw materials, manufacturing, distribution, use, end-of-life) for a key product or service.
2. Identify hotspots qualitatively: where are the largest resource inputs, emissions, or costs likely to occur; for example, energy-intensive production, high-impact materials like aluminium, long transport distances, or problematic waste streams.
3. Select a few indicators: such as material use per unit, recycled content, energy use in manufacturing, product lifetime, proportion of recoverable materials, or packaging to product ratio.
4. Test improvement options: compare alternative designs or supplier options against these indicators to see which direction is better.

UNEP's work on the business case for life cycle thinking emphasises that even simple hotspot analyses can uncover “no-regret” options that reduce environmental impact and costs simultaneously, such as switching to less wasteful packaging formats or optimising component sizes to standard sheet dimensions.

For SMEs, the key is to keep it manageable. Rather than aiming for perfect knowledge across entire portfolios, it is more realistic to:

- Focus initially on one or two high-volume or high-impact products.
- Use supplier data and generic databases where available but accept that some numbers will be estimates.
- Concentrate on decisions that are under the company's control, such as material choices, design features and packaging, rather than trying to model global value chains in detail.

As understanding grows, life-cycle thinking can gradually be extended to more products and integrated with energy and carbon management work already being done under other modules.

13.4 Circular strategies for products, packaging and services

Moving from analysis to action means adopting concrete circular strategies. A useful way to think about this is to consider how a product's value can be preserved or extended at different stages, from design and production through use and end-of-life. Practical guidance tailored to SMEs identifies several recurring patterns.

Designing for durability, repair and upgrade

Making products more robust, easier to repair and upgrade is one of the most powerful circular strategies. This can involve:

- Using higher-quality components in critical parts to extend lifetime.
- Designing joints and housings so they can be opened and reassembled with standard tools.
- Providing spare parts and clear repair instructions, either in-house or through local partners.

Eurofound's collection of SME case studies describes firms that redesigned tools and furniture for durability and modularity, enabling cheaper repairs, longer use and attractive service contracts. Such strategies not only reduce waste but can create new revenue streams in maintenance, refurbishment or certified second-hand sales.

Smart material choices and reducing waste

Choosing more sustainable materials is not only about swapping one plastic for another. It involves rethinking material intensity and waste across the value chain. SMEs can:

- Reduce material use per product by optimising dimensions and eliminating unnecessary components.
- Prefer materials with established recycling systems and avoid hard-to-separate composites.
- Increase the share of recycled content where quality and safety allow.

Analyses for the European circular economy strategy note that improving product design and materials can significantly cut waste volume and toxicity, reducing downstream treatment costs and environmental risks.

Several SME support initiatives show that simple interventions – such as standardising materials to fewer types, redesigning cutting patterns, or working with suppliers to return offcuts – can drastically cut production waste.

Circular packaging

Packaging is a visible area where customer expectations and regulation are evolving quickly. The EU's work on a revised Packaging and Packaging Waste Regulation is pushing towards reusable systems, higher recycled content and better recyclability. SMEs can respond by:

- Reducing empty space and material overuse in packaging.
- Switching from multi-layer, hard-to-recycle films to mono-material or fibre-based options where appropriate.
- Introducing reusable packaging in B2B relations, for example returnable crates or pallets.

Consumer research suggests that customers increasingly value environmentally friendly packaging and that clear communication about packaging choices can enhance brand perception.

Product-service systems and new revenue logics

Circularity is not only about materials. It also implies reconsidering how value is delivered. Instead of one-off sales, SMEs can experiment with service-based models where they retain ownership of products and earn revenue through leases, subscriptions or pay-per-use schemes. This incentivises durability and efficient maintenance, since the provider benefits from keeping products in service longer.

Examples include:

- Leasing equipment rather than selling it outright, with preventive maintenance built into the offer.
- Offering “product as a service” models, such as lighting, printing or textiles, where clients pay for performance and the provider manages refurbishment and end-of-life.

These models are not appropriate for every SME, but even modest steps, such as offering extended warranties or maintenance contracts, can shift incentives towards longer product life and stronger customer relationships.

Reverse logistics, partnerships and industrial symbiosis

Circular strategies usually require new collaborations. SMEs rarely control all steps of the value chain, so closing loops depends on partners willing to take back materials or supply secondary raw materials. Recent guidance for SMEs highlights opportunities in:

- Collaborating with waste management firms or recyclers to establish take-back schemes for products or packaging.
- Joining local or sectoral networks to exchange by-products and waste streams, for example one firm’s organic waste becoming another’s input.
- Participating in industrial or business clusters focused on circular economy, which can offer shared logistics, common infrastructure or joint marketing.

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The iED article on circular economy challenges and opportunities for SMEs stresses that limited resources, knowledge gaps and supply-chain complexity are major barriers, but that collaboration and knowledge sharing are among the most effective ways to overcome them.

Digital tools for circularity

Digitalisation can support circular strategies by improving traceability, monitoring and coordination. For example, QR codes and product passports can store information on materials and components to facilitate repair and recycling. Inventory and data systems can help manage refurbished or secondary products. While full digital product passports may be a longer-term ambition, SMEs can start by capturing basic product information in structured form and sharing it with key partners.

13.5 Making circularity manageable in SMEs

All of these strategies raise a practical question: how can a small or medium-sized business move in this direction without being overwhelmed? The evidence from European projects and SME case studies suggests a few success factors.

First, management commitment and a clear mandate are critical. Several studies recommend appointing a “circular economy champion” or integrating circular responsibilities explicitly into an existing role, such as operations or quality management. This person does not need to be a full-time specialist, but they need time and support to coordinate initiatives, collect information and liaise with external partners.

Second, SMEs benefit from starting with focused pilots rather than trying to redesign everything at once. For instance:

- Select one product line or packaging type for a circular redesign project.
- Apply an LCA-lite hotspot analysis to understand where the biggest impacts and costs are.
- Test a limited set of eco-design and circular interventions, measure the outcomes, and then scale successful approaches to other parts of the business.

Interreg experience shows that pilot projects, combined with simple tools and peer exchange, help SMEs progress from seeing circularity as abstract to treating it as practical business improvement.

Third, external support and networks matter. SMEs that engage with cluster initiatives, business support organisations or EU-funded projects often gain access to expertise, tools and funding that they could not mobilise alone. Eurofound’s work on design for sustainable development emphasises the role of local networks in sharing knowledge and reducing the cost and risk of experimentation.

Finally, it is important to connect circular initiatives with overall business strategy. This means:

- Tracking not only environmental indicators, but also how circular measures affect costs, revenues and risk exposure.
- Aligning circular priorities with customer expectations and regulatory trends, for example anticipating eco-design or packaging requirements in target markets.
- Communicating improvements clearly and honestly, avoiding exaggerated or vague claims.

When circularity is linked to competitiveness, compliance and innovation, it is more likely to survive changes in personnel or market conditions. As the circular economy

becomes more embedded in EU policy and markets, SMEs that invest in better materials management, eco-design and life-cycle thinking will be better placed to meet customer demands, comply with emerging rules and secure their position in evolving value chains.

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