

Future- Ready Textiles

Signals, scenarios & strategic
pathways for systemic transition



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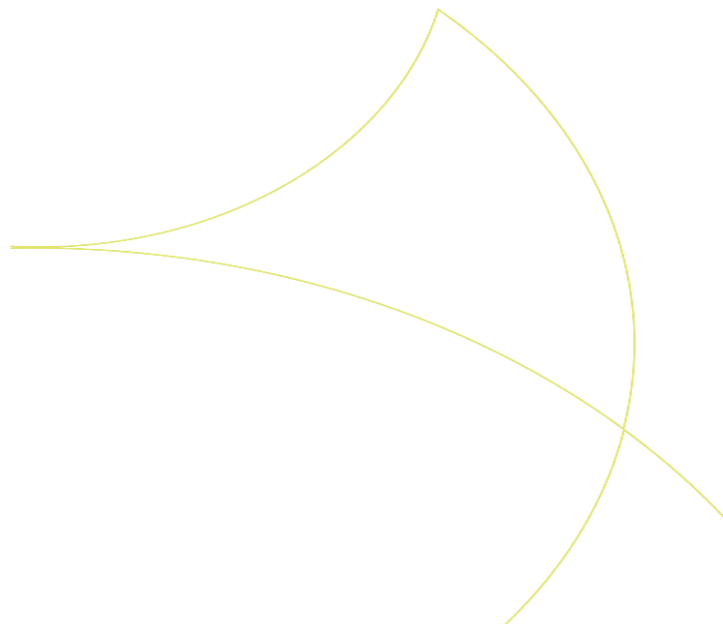
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EXECUTIVE SUMMARY

The European textile and fashion sector is entering one of the most profound transformation periods of the past decades. Growing policy and regulatory pressure, increasing resource constraints, labour shortages and rising social and environmental expectations are converging to challenge long-standing production, business and value creation models. At the same time, global competition, cost volatility and uncertainty are testing the resilience of both large brands and SMEs across the value chain.

Despite this, responses across the sector remain largely fragmented. Many organisations continue to rely on isolated pilots, compliance-driven initiatives or single technological solutions that are insufficient to address the interconnected nature of today's challenges. This insight report synthesises learnings from the Future-Ready Textiles workshop series led by Climate KIC in 2025. The workshops brought together a multi-stakeholder group to collectively explore the future of the textile system, identify emerging signals of change, stress-test alternative futures and examine how coordinated action can unlock systemic transformation.

Approximately 70% of participants represented textile manufacturing companies and fashion brands in key textile regions including Poland, Spain and Italy (with strong representation from Regional Innovation Scheme (RIS) countries), complemented by research and academia, NGOs and philanthropic organisations, consultants, entrepreneurs and policymakers. This diversity enabled cross-value-chain dialogue and shared sensemaking, reflecting the reality that no single actor can drive the transition alone.

Three headline insights from the collective work:

The challenges are systemic, not only technical.

Environmental degradation, overproduction, social inequality and compliance pressure are deeply interconnected. Addressing them requires coordinated interventions across behaviour, finance, policy, skills and infrastructure, not isolated solutions or stand-alone projects.

Signals of change are accelerating across the system.

Shifting consumer values, expanding digitalization, traceability requirements and the emergence of new circular and local infrastructures indicate that the current system is already in transition. Organisations that fail to engage with these signals risk strategic misalignment.

Transition-ready capabilities are the missing link.

Beyond technical innovation, organisations need systems thinking (understanding how behaviours, incentives, policies and infrastructure interact across the value chain) and the ability to collaborate across value chains and sectors to unlock new forms of value creation.

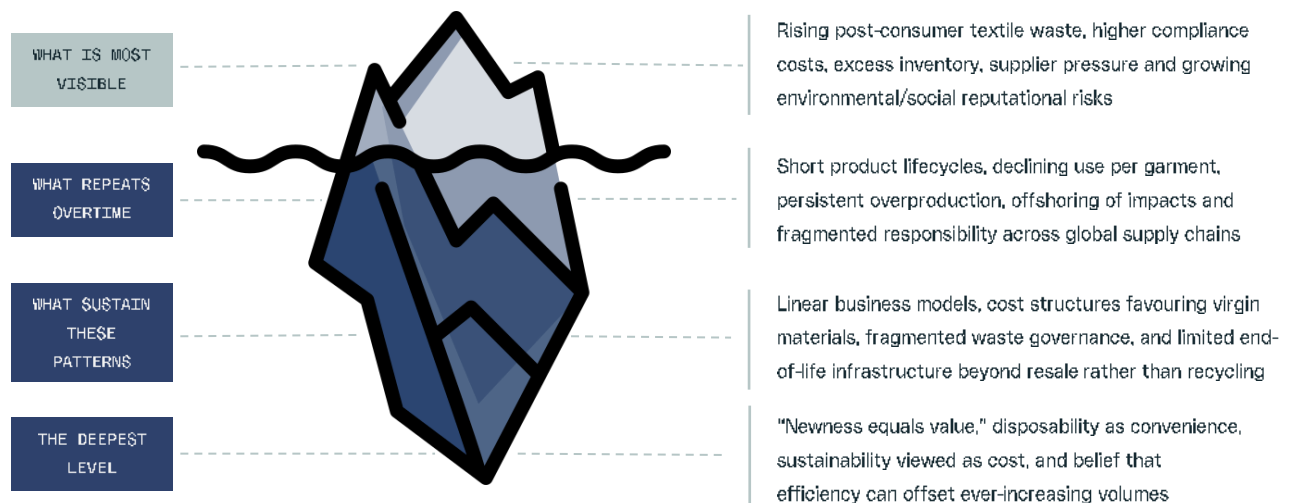
Together, these insights point to an urgent need to rethink not only what changes in the textile sector, but how change is understood, designed, and implemented. This report provides a system-level perspective to support industry leaders, associations, policymakers, and ecosystem actors in shaping a more resilient, circular, and future-ready textile economy.

THE CHALLENGES OF THE TEXTILE SECTOR THROUGH A SYSTEMIC LENS

A global assessment estimates that in 2024 alone, the world discarded approximately 120 million metric tons of textiles, with around USD150 billion in raw material value lost each year, while less than 1% of textile waste is recycled into new fibres¹.

These outcomes are not the result of individual failures, but of reinforcing dynamics across the system: the textile sector does not have a single “waste problem,” a “materials problem,” or a “consumer problem.” It has a systems problem, in which linear incentives, fragmented governance, cultural norms, infrastructure gaps and misaligned financial signals reinforce one another and lock the system into patterns that resist change.

In the Future-Ready Textiles series, such challenges were mapped out and seen as a web of interconnected levels shaping system behaviour:



¹ Boston Consulting Group (2025). *Spinning Textile Waste into Value*.



CASE STUDY

Human Material Loop: transforming human hair waste into a new fibre ecosystem

A material innovation company transforming discarded human hair into Adara®, a high-performance natural fibre for technical textiles



The visible industry problem

- The textile industry is still heavily reliant in fossil-based materials and virgin feedstock
- Growing shortage of lower-impact materials
- Rising pressure from soil depletion, chemicals, supply chain



What locked the system in place

- Patterns**
 - 2.2 bn kg of human hair waste every year
 - No recovery or reuse systems
- Structures**
 - Hair treated as waste
 - No collection logistics or processing ecosystem
- Mindsets**
 - "Hair isn't a material"
 - "High-performance = synthetic"



What Human Material Loop changed

- Turned discarded hair into Adara®, a high-performance natural fibre for technical textiles applications
- Created new roles (hairdressers → feedstock partners)
- Built new logistics + green chemistry + local supply loops



Key insight: Innovation emerges when we shift structures and mindsets, not just products, unlocking new material categories, new supply chains and new collaborations.

Isolated solutions struggle to scale

A system-level mapping developed by the H&M Foundation and Accenture² illustrates how emissions, resource use, labour conditions and value creation are distributed across a dense web of actors, infrastructures, regulations and cultural forces. Their analysis underscores that no single innovation can transform the textile system in isolation; impact emerges only when solutions are connected, scaled and embedded across the value chain.

For example, fibre-to-fibre recycling initiatives remain constrained by mixed materials, insufficient feedstock quality and weak economic incentives upstream. Traceability systems are increasingly implemented to meet regulatory requirements, yet often overlay existing supply chains without

² H&M Foundation/Accenture (2025). *From Signals to System Change*.

changing production volumes, purchasing practices or end-of-life responsibility. Even well-intentioned sustainability programmes can stall when they clash with entrenched cost structures, short-term sourcing decisions or consumer expectations of low prices and rapid turnover.

Technological innovation is essential to the textile transition. Advances in textile-to-textile recycling, bio-based materials, digital traceability and automation are critical enablers of change. However, participants also observed that **technical innovation alone cannot resolve challenges rooted in structures and mindsets**. Innovations that promote durability, reuse or circularity often challenge deeply embedded assumptions about fashion, consumption and growth. Without shifts in narratives, incentives and organisational capabilities, pilots remain marginal and struggle to move from experimentation to transformation.

Shifting from isolated initiatives to systemic change

The remainder of this report builds on this diagnosis, exploring how early signals of change, emerging system shifts and new capabilities point toward alternative futures for the textile sector, and what it will take for organisations to navigate this transition intentionally rather than reactively.

A systemic perspective reframes the core challenge facing the textile sector: not how to optimise parts of the existing model, but how to **reconfigure the conditions that shape behaviour across the value chain**. This includes:

Redesigning incentives so durability, repair and reuse become economically viable

Aligning policy, standards and infrastructure to support circular flows at scale

Building new relationships between brands, suppliers, recyclers, municipalities and consumers

Challenging mental models that equate growth with volume and innovation with substitution

SIGNALS OF CHANGE: WHAT THE SYSTEM IS TELLING US

The signals of change identified during the Future-Ready Textiles workshops are not isolated trends or incremental market developments. They are early indicators that the textile system's underlying structures, power dynamics, mindsets and relationships **are beginning to shift**.

Participants were invited to step back from immediate problems and engage with the **bigger picture**; rather than focusing on symptoms, the exercise surfaced where the system itself appears to be **loosening from the status quo**, creating space for new practices to emerge. Five clusters of signals stood out:



Circularity

- The growing prominence of repair, reuse, resale, and Product-as-a-Service (PaaS) models signals early movement away from linear, volume-driven consumption and toward extending product lifetimes through maintenance, access-based use and secondary markets
- The expansion of Extended Producer Responsibility (EPR) schemes and investment in textile recycling indicates a gradual transfer of responsibility upstream, with rising expectations that circularity be designed into products, business models and supply chains from the outset



Next-generation materials

- Signals related to bio-based, regenerative, and waste-derived materials highlight innovation that is pushing against established sourcing practices, certification regimes and performance assumptions
- Material innovation is creating pressure on existing standards, procurement criteria and sourcing relationships, revealing misalignment between emerging material pathways and current industry practices



Digitalization & traceability

- Trends such as Digital Product Passports (DPPs), data-driven climate disclosure, AI-enabled traceability, and automation indicate that transparency is rapidly moving from a voluntary differentiator to a market-access requirement
- This shift redistributes power and responsibility across the value chain: data becomes a form of shared infrastructure that shapes participation in future markets, while raising concerns

around digital readiness, interoperability, and cost burdens, especially for SMEs and upstream suppliers



Decarbonization

- Participants identified growing use of carbon-integrated traceability, electrification of production processes and exploration of lower-impact materials
- At the same time, many efforts remain anchored in reporting and compliance rather than absolute emissions reduction, highlighting the need to link decarbonisation strategies to changes in production volumes, sourcing decisions, energy systems and business models



Social innovation

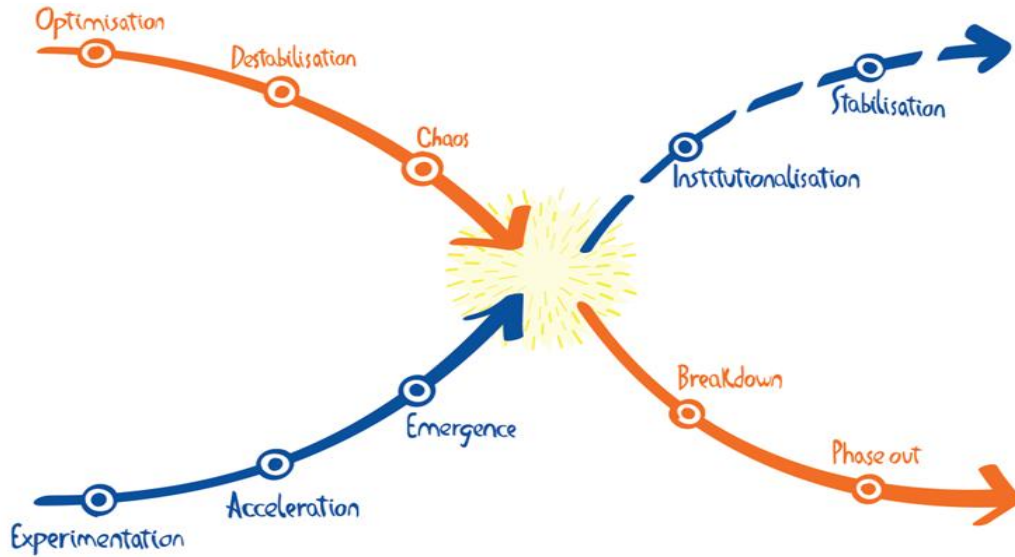
- Attention to worker representation is increasing, gender-responsive workplaces and binding social accountability mechanisms
- Circular, repair, and digital models are reshaping skill requirements, while traditional craftsmanship and tacit knowledge continue to erode
- Capacity building, mental health and fair working conditions are increasingly understood as foundational enablers of transformation, in an industry that is losing its attractiveness to younger generations

What these signals collectively reveal

Across these signal clusters, a consistent picture emerges: the textile system is already shifting, but in **fragmented and uneven ways**. Declining practices are losing legitimacy faster than new ones are gaining dominance, creating a transition zone characterised by experimentation, tension and uncertainty. Recognising these signals is not about predicting a single future, but about understanding **where and how the system is changing**, and what capabilities organisations need in order to future-proof their activities.

INSIGHTS FROM THE X-CURVE: WHAT IS DECLINING AND EMERGING IN TEXTILES

The X-Curve exercise used during the workshops helped participants make sense of the textile sector's transition by visualising two dynamics unfolding in parallel: the **destabilisation of dominant linear practices** and the **emergence of new regenerative, digital and circular systems**. Rather than a smooth substitution, the transition is characterised by overlap, tension, and uncertainty, requiring organisations to actively manage decline while investing in what comes next.



The X-Curve is a powerful sensemaking visual tool that helps understanding of systems and its interactions. Source: DRIFT/Climate KIC



What is declining



On the downward curve, participants identified a set of practices and assumptions that are increasingly becoming unviable under regulatory pressure, resource constraints and social expectations:



- ↓ Linear “make–use–waste” models are losing viability due to dependence on virgin materials, price volatility, and rising policy risk
- ↓ Optimisation-driven supply chains, even with added traceability, struggle to meet growing demands for transparency and accountability
- ↓ Persistent social inequities and weak worker representation continue to undermine system stability
- ↓ Regulatory restrictions on hazardous substances (e.g. PFAS) signal that established material and process choices are no longer future-proof

What is emerging

At the same time, the upward curve reveals a diverse set of practices gaining momentum across materials, business models, infrastructure and governance:

- ↑ Regenerative, water-smart and waste-derived materials, alongside industrial symbiosis models, signal a shift from extractive to regenerative material logics
- ↑ Repair, re-commerce, and Product-as-a-Service models challenge volume-driven growth by extending product lifetimes and creating new sources of value
- ↑ Digital Product Passports, AI-enabled traceability, and strengthened EPR frameworks are becoming embedded, reshaping incentives and accountability across value chains



What the X-Curve reveals for the industry

By placing current practices and emerging initiatives along the decline and build-up curves, organisations can identify where their strategies may be **misaligned with the direction of the system**, and where future value is starting to form. Specifically, participants used the X-Curve to:

■ Reveal misalignment risks

Understand where existing strategies remain anchored in declining systems, such as reliance on virgin fibres and linear waste models

■ Spot opportunity spaces early

Identify emerging areas of value creation across materials, data, services and business models before these become mainstream or competitively crowded

■ Navigate transitions more safely

Anticipate friction points related to skills, partnerships, infrastructure and compliance, allowing organisations to prepare proactively rather than react under pressure



CASE STUDY

VIVE Group: activating multiple textile waste loops to recover value across the system

An integrated business model combining industrial recycling, second-hand markets, education and material innovation



The systemic problem

Europe lacks large-scale textile sorting & reuse infrastructure. As a result:

- Most textiles bypass municipal systems
- Valuable materials leak into landfill or low-value channels
- Circular models stall without reliable feedstock & logistics



What VIVE built

A full circular ecosystem at industrial scale:

- **330,000 kg sorted daily**
- **90 reuse stores** normalising second-hand
- Partnerships with **municipalities, NGOs, schools & shopping centres**
- **Game4Planet:** collection + awareness + education
- **Texcellence@:** recycled composite for construction & public spaces



The business value

- Supports upcoming **EPR, DPPs** and traceability needs
- Reliable supply for reuse, recycling, upcycling and innovation
- Accessible reuse channels shift consumer habits from disposable → durable
- New revenue streams (composites, resale, local reuse, logistics innovation)



Key insight: Strengthen the "build-up" side of the X-Curve by creating new capabilities, new behaviours and new markets

SCENARIOS FOR 2035 & THEIR IMPLICATIONS

To support organisations in navigating uncertainty, the Future-Ready Textiles workshops used **scenario planning** as a structured foresight tool to explore how the textile system could evolve by 2035. Building on identifying **systemic drivers and signals of change**, the scenario exercise enabled participants to:

- **Explore multiple credible futures** for the textile sector, rather than a single forecast
- **Examine how business models may adapt, diversify, or reorganise** as the wider system reconfigures
- **Identify how changes in materials, labour, policy, markets, technology and consumer behaviour** may interact and where current strategies may no longer hold
- **Make strategic choices that remain robust across multiple possible futures**, rather than optimised for only one

The scenarios presented below represent three distinct but plausible pathways for the textile sector in 2035, grounded in signals already visible today. They are intended to support strategic reflection, collaboration and action across industry, policy and the wider ecosystem.

SCENARIO 1

Regenerative, Local & Digitally- Enabled Circularity

By 2035, textiles operate through regional value loops where repair, reuse, remanufacturing and recycling are embedded into mainstream infrastructure. Digital systems track products and materials across their lifecycle, making circularity the default operating logic rather than an add-on.

Drivers: EPR and eco-design regulation; Digital Product Passports and traceability infrastructure; rising volatility of virgin materials; growth of community-based repair and re-commerce ecosystems.

What changes for the ecosystem: Stronger local circular infrastructure; tighter integration between brands, municipalities, recyclers and service providers; higher demand for repair and reverse logistics skills.

Signals: Repair networks and resale platforms scale; textile-to-textile recycling investment rises; product data links to end-of-life pathways. Value shifts from volume to lifetime performance, service, and recovery; new roles expand in repair, sorting, remanufacturing, and reverse logistics; policy impact depends on harmonised infrastructure and enforcement.

Early actions: Design for durability, repairability, and traceability; build partnerships with repair/resale/recycling actors; invest in data systems connecting use-phase to end-of-life.

SCENARIO 2

Conscious Consumption, Circularity & Equity

By 2035, consumption patterns shift toward fewer, better, longer-lasting products as social norms, education, and incentives reshape what people value. Circularity accelerates alongside stronger expectations of transparency, fair labour, and inclusive outcomes.

Drivers: Rising consumer awareness of environmental and social impacts; due diligence and labour regulation; public incentives for reuse and access-based models; cultural narratives redefining status, ownership and value.

What changes for the ecosystem

Greater demand for verified social and environmental performance; workforce transition becomes central; brands and suppliers face stronger expectations on purchasing practices and equity.

Signals: Greenwashing faces greater scrutiny; transparency on labour conditions is expected; reuse marketplaces, community initiatives and shared ownership models expand. Trust and social credibility emerge as competitive advantages, supplier relationships evolve through worker voice and skills investment, and policy increasingly aligns social and environmental goals.

Early actions: Invest in skills, representation, and safe transitions; align claims with verifiable data; pilot access-based models that reward durability and fairness.

SCENARIO 3

Responsible, On-Demand & Transparent Production

By 2035, production is demand-driven, digitally orchestrated, and highly transparent. Overproduction is reduced through predictive analytics, automation, and near-real-time data flows, while compliance and traceability become institutionalised across value chains.

Drivers: AI-enabled demand forecasting and optimisation; mandatory digital traceability and reporting; cost pressures from excess inventory and logistics volatility; brand-supplier partnerships focused on resilience and compliance.

What changes for the ecosystem

Data infrastructure becomes a participation threshold; closer coordination across tiers; new risks around SME readiness and interoperability.

Signals: AI and predictive traceability tools scale; DPP regulation expands; purchasing practices and lead times are reformed; on-demand and near-shoring models grow. Transparency becomes both compliance requirement and strategic asset.

Early actions: Strengthen digital infrastructure and data governance; align purchasing with demand-driven production; collaborate across tiers to reduce waste and systemic risk.

Some insights were clear across all scenarios:

- **Financing models** must shift to support repair, reuse and true-cost pricing
- **Digital infrastructure** is foundational across all futures
- **Skills and labour transitions** are central to system change
- **Partnerships** determine the pace and scale of transition
- **Consumer behaviour** is shaped by design, incentives and narratives

PORTFOLIO INSIGHTS: WHERE OPPORTUNITIES CLUSTER

Insights from the Future-Ready Textiles workshops consistently highlighted one core challenge: **no single solution, pilot or innovation can shift the textile system on its own.** While many promising initiatives exist, they often remain fragmented, compete for attention and funding, or address symptoms rather than root causes. Participants contrasted two common patterns observed across the sector:



Fragmented "confetti" initiatives: disconnected projects spread thinly across organisations, geographies and themes, often innovative, but lacking orchestration, scale or systemic impact



Coordinated "spaghetti" portfolios: by a portfolio of interventions, we mean a deliberately connected set of actions working together across different parts of the system (business models, skills, finance, infrastructure, policy and culture) aligned toward a shared transition goal

To respond to this complexity, the workshops introduced a **portfolio approach to systems innovation**, which focuses on orchestrating multiple, complementary interventions that reinforce each other over time.

Opportunity clusters emerging from the workshops

Across modules and stakeholder groups, participants identified a set of **opportunity clusters** that act as leverage points for transformation, working across value chains:

Product-as-a-Service, resale, leasing, and access-based models that shift value creation from sales volume to use, durability and recovery

EPR, repair incentives, public procurement and blended finance that realign economic signals with environmental and social outcomes

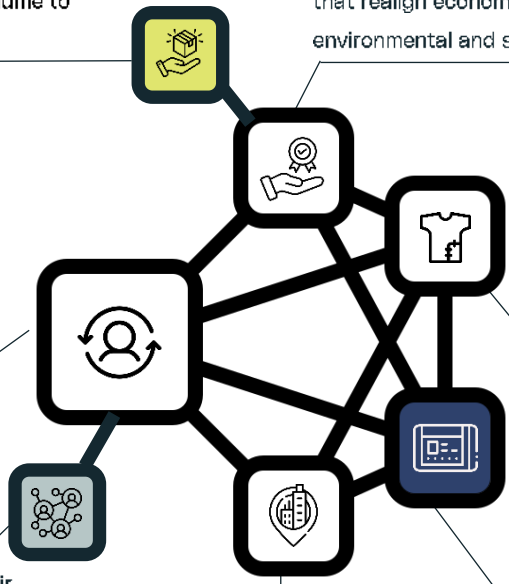
Shifts in norms around **consumption, ownership, durability and value**, enabled through design, incentives, education and storytelling

Capabilities spanning repair, digital traceability, materials innovation, systems thinking and cross-value-chain translation, alongside just and inclusive labour transitions

Regional networks for repair, reuse, remanufacturing and re-commerce that extend product lifetimes, create local employment and reduce material dependency

Cities and regions as key partners in repair infrastructure, waste systems, public procurement and place-based experimentation with industry and SMEs

Common **digital and physical infrastructure**, such as DPPs, sorting and collection systems, and interoperable data platforms—that no single actor can build alone



CASE STUDY
Droppie **Droppie: incentivising clothing returns to unlock circular flows**

A consumer-facing return system that rewards people for bringing unwanted clothes back into local collection points



The systemic problem

Overconsumption → disposability is still the dominant logic. People want to “do the right thing,” but:

- Return pathways for clothing are fragmented or inconvenient
- Consumers lack clear incentives to participate in reuse
- The system treats used garments as **waste**, not value
- Brands have limited visibility on post-consumer flows



What Droppie does

An easy, gamified return system that:

- Changes meaning (waste → resource)
- Changes behaviour (discarding → returning)
- Changes incentives (participation is rewarded)



What is unlocked

Return points in everyday locations normalise reuse and reduce friction.

- Material flows become visible → enabling EPR, DPP, and circular design decisions
- Local businesses, retailers, recyclers, and community actors reinforce each other
- Participants increasingly see textiles as assets, not waste

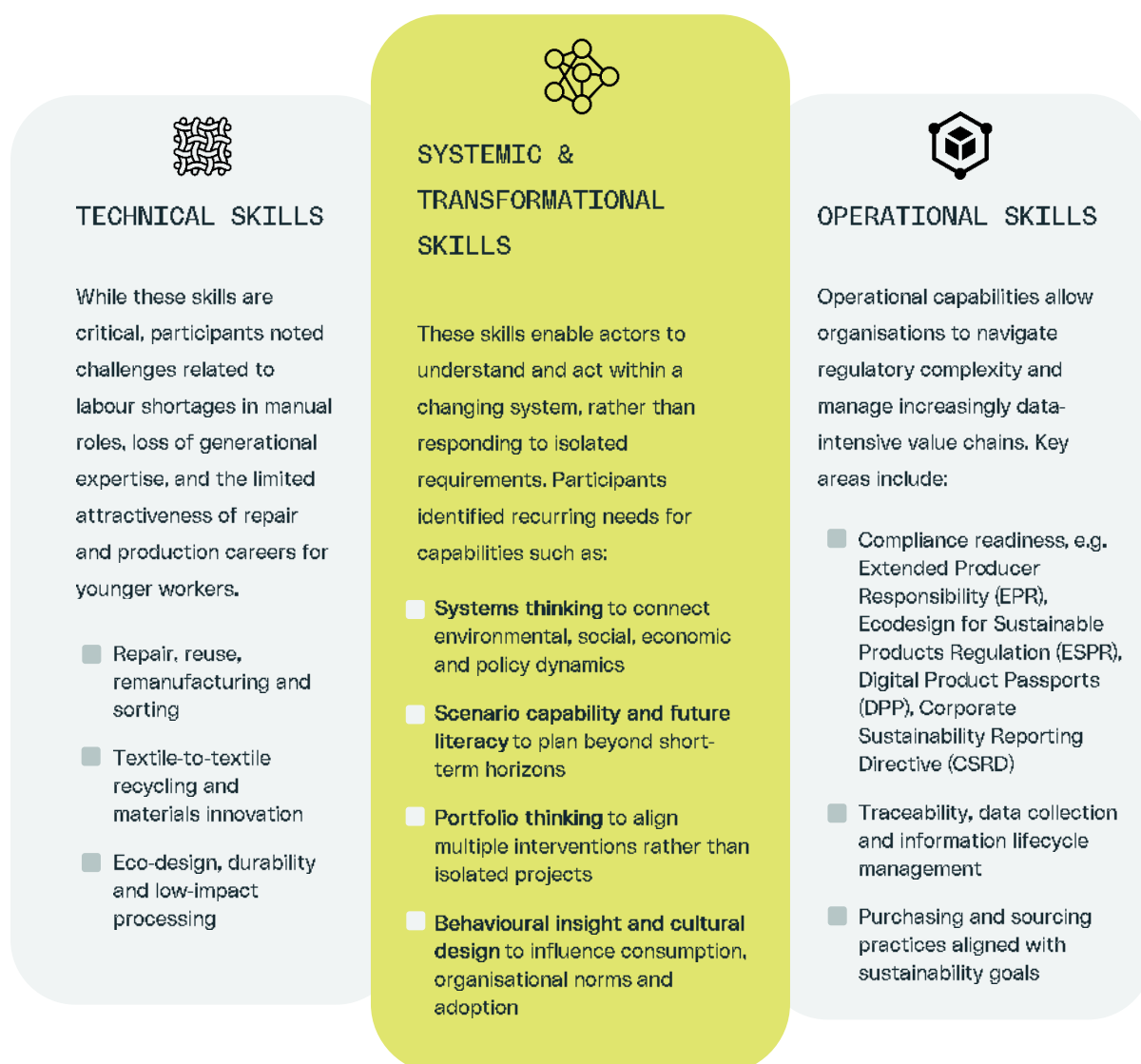


Small, everyday interventions can shift the system when they change incentives, habits and meaning

THE TEXTILES TRANSITION SKILLS GAP

Across the Future-Ready Textiles workshops and focus groups, participants consistently highlighted that **skills and workforce transitions are a decisive factor in the textile sector's ability to navigate systemic change**. While policy frameworks, technologies and business-model innovations are advancing, the human capabilities required to connect and operationalise these shifts are not keeping pace.

Importantly, the gap identified is not only technical. Rather, it reflects an imbalance between what the system is asking organisations to do and the types of skills currently prioritised in training and professional development. Insights from the workshops point to three interconnected layers of skills required to support a successful textile transition:



Why systemic capabilities matter

The workshops revealed a recurring pattern: **high awareness of the need for transformation, but limited capacity to navigate complexity and coordinate action.** Technical and operational skills address important parts of the challenge, but on their own they are insufficient to shift entrenched system dynamics.

Systemic and transformative skills act as a **multiplier**, enabling technical expertise, regulatory compliance, and innovation investments to reinforce each other rather than compete or stall. In this sense, they do not replace existing skill development efforts, but **complement them**, helping organisations translate insight into coherent, long-term transition pathways.

Authors

This report was developed by Climate KIC's Industry and Value Chains team, and the Climate KIC Learning team, drawing on insights from the Future-Ready Textiles workshop series and multi-stakeholder focus groups conducted in 2025, involving industry associations, farmers, manufacturers, fashion brands, textile recyclers, researchers and NGOs.



Climate KIC is Europe's leading climate innovation agency, community and platform, working to accelerate the transition to a climate-resilient, regenerative, and inclusive economy.

With over 15 years of experience, Climate KIC supports organisations and regions in navigating complex, systemic challenges by analysing system dynamics, identifying leverage points, and enabling collaborative action across value chains. Its work spans policy, business, research and civil society, operating in the space where no single actor can deliver change alone.

Climate KIC's systems innovation approach supports industrial transition by designing, convening, and activating portfolios of interventions that align experimentation, investment, learning and policy. Rather than delivering standalone programmes or solutions, this approach enables ecosystems (industry associations, companies, cities, researchers and policymakers) to move toward shared transition outcomes, while adapting to uncertainty and learning in real time.

To date, Climate KIC has worked across more than 39 countries, supported over 44,000 learners and practitioners, and partnered with European institutions, international organisations and global funders.

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