DELIVERING THE ROADMAP

While the science and data on the impact of textiles on the environment has reached a consensus, the level of ambition has not. It is clear that we need to act in a more ambitious and urgent manner to reach not only the Paris Agreement but also the 2030 Agenda.

This document forms an annex to the United Nations Environment Programme report, Sustainability and Circularity in the Textile Value Chain: A Global Roadmap, which outlines the key priorities and actions needed to deliver a sustainable and circular textile value chain.

From the Roadmap report, three overarching and interconnected priorities to deliver system change emerge: 1) shifting consumption patterns, 2) improved practices and 3) infrastructure investment.

To deliver on the three priorities, UNEP proposes nine building blocks to achieve a sustainable and circular textile value chain. All building blocks consider the key drivers of environmental and/or socioeconomic impacts within the value chain, support the delivery of the existing industry goals, and require multiple stakeholders to act together.

While the Roadmap report specifically explores the cross-stakeholder opportunities for change, and how collaboration can be facilitated, in delivery against the nine building blocks, it is also important to recognize that each stakeholder group has unique challenges, and a unique role and contribution to make. For this reason, the annexes of the Roadmap report detail the barriers and opportunities, as well as specific actions for each stakeholder group.

This annex outlines the role and actions that innovators and recyclers can take in transforming the textile sector towards sustainability and circularity.
DEFINITION OF INNOVATORS AND RECYCLERS

Innovators across the textile value chain and recyclers are similar in the sense that they both often inherently build upon models, systems or aspirations that are in line with a sustainable and circular textile value chain. This does not mean they have already achieved full sustainability and circularity, but rather that their approach takes those principles as a basic premise, and they often have an in-built mission to improve sustainability and circularity performance. Based on this inherent positioning of business models and aims, these two types of value chain stakeholders are grouped together for the purpose of the Roadmap report.

Innovative brands and retailers

Innovative brands and retailers are defined here as new or relatively new brands and retailers that have built their business upon principles of innovation, sustainability and a circular business model, as opposed to conventional brands and retailers that have existed for a long time and need to retrofit their business to implement circular and sustainable models. Such brands and retailers include rental and resale platforms, brands that have built a supply chain on sustainable sourcing and production principles, those providing repair and longevity services, or those that are already closing the loop on their products through fibre-to-fibre recycling. This group of companies might be moving closer to sustainable and circular goals, although it remains important for them to have a clear set of goals and impact measures to fully demonstrate their achievements.

Technical innovators

When stakeholders discuss circularity, this group is often first identified. Technical innovators and start-ups are defined here as those companies creating new technical solutions to a range of problems, including innovative and recycled fibre production (e.g. technology to separate blended fibres or create fibres from waste), technologies for managing traceability or value chain data management (e.g. RFID tracking systems), innovations in production processes (e.g. new waterless dying technologies), technologies for innovative customer experiences (e.g. on-demand production systems), or technologies to power alternative business models (e.g. reverse logistics solutions to support reselling). They might also provide innovative solutions to challenges around B2B and B2C packaging.

Resellers, recyclers and those in the waste stream

While resellers, recycling and waste collection providers might not be new and innovative companies, they are vital for enabling the kind of innovation necessary to move towards a circular system. Resellers cover a range of actors within a global network of pre- or post-consumer product reselling. They often take unsold stock and find alternative markets for it, work with collectors to resell items within the same region or ship it to other markets for reselling.

At present, recyclers and those in the waste stream typically take items that are not fit for reselling as the original items and repurpose them for other functions, e.g. insulation. They also manage processes for gathering rPET bottles and bringing them into the value chain as recycled polyester. Although there is very little fibre-to-fibre recycling at present, recycling companies and organizations are often actively engaged in the potential for improving recycling infrastructure for textiles, including potential solutions for road-side collection.

OPPORTUNITIES

This group may be more equipped than any other to embrace the opportunities of the sustainable and circular textile value chain, given that they operate business models based on sustainability or circularity. This positions them to expand into the market and unlock new business offers as the transition becomes more established. There are major opportunities for those who are innovating solutions for fibre tracking, sorting, separating and fibre-to-fibre recycling, as well as those developing industrial symbiotic raw materials, innovative processing technologies, etc.
BARRIERS TO ACTION AND INTERDEPENDENCIES WITH OTHER STAKEHOLDER GROUPS

Demonstrating benefits: Evaluating and demonstrating the actual impacts and benefits of innovations is challenging in a context in which data is complex and expensive to obtain. It is also challenging to break into new marketplaces where consumers and solution users are often still uncertain of the business value of innovations and alternative offers.

Infrastructure and behavioural barriers: Collection and sorting are key steps to enable value retention loops, and current textiles sorting largely relies on voluntary donations of used products, as well as the tactile judgement of experienced workers to identify materials. Most countries do not have consistent processes for gathering used textile products (such as road-side collection) and do not have effective messaging to consumers on end-of-life behaviour such as diverting from landfill. Physical labels can fade and do not capture information about chemical inputs and processes, which makes sorting labour-intensive, costly and inaccurate. Further, a lack of infrastructure for information transfer and best-practice sharing can be a barrier for some innovators and recyclers.

Uncertainties and complexities in resale: Resellers might see major changes in the dynamics of their value chain going forward. Current reselling patterns are complex, with textiles often being shipped from western markets to developing countries where the costs might outweigh the benefits, prompting some countries to ban imports of post-consumer textiles. In the future, patterns of reselling might change considerably, with western resale markets potentially increasing as non-western countries increasingly discourage imports.

HOW TO PRIORITIZE

Innovators and recyclers can leverage their unique role in the textile value chain to facilitate its transformation towards sustainability and circularity. While there are a range of key actions listed in the following section, the three ways that innovators and recyclers should leverage their role and actions can be summarised as:

“Provide the solutions and innovations for change.”

Create new circular offers and technologies: Create new models of sharing, reuse and longevity, reflecting local identity and infrastructure context, normalize new business models with consumers, and focus R&D on new technologies to support circularity.

“Ensure that solutions are created and adapted for multiple types of users and contexts.”

Create accessible and scalable solutions: Create solutions that are scalable, and technically and financially feasible for all actors in the value chain, considering the different conditions in each production and consumption market and ensuring accessibility for all business sizes, e.g. SMEs, those in developing countries and different consumer types.

“Be realistic and tactical about scaling change in a challenging system.”

Plan for market realities: When bringing an innovation to market, identify business strategies that accept and address existing market barriers, such as a lack of visibility and information, inertia of technological change, a lack of consumer engagement, policy barriers, etc. Ensure that business plans accurately take account of fundamental challenges and identify collaborators that can help to address these challenges, e.g. industry bodies that can share information directly with producers.
The list of actions following on the next page aims to offer a sense of the most urgent priorities for this stakeholder type, based on industry consultation and scientific analysis (i.e. actions that hold the most potential to address hotspots are prioritized). This does not mean that each stakeholder should undertake each action, but instead it is recommended that you further prioritize actions based on a number of key criteria, including:

- **What has already been done** by the actor (i.e. you might have already implemented some of the actions proposed). Further, identify existing goals or KPIs and evaluate whether they are sufficiently relevant and ambitious.

- **The degree of impact likely to be driven by each action**, based on your organization's own specific impacts, scale and challenges or the possible influence in the wider value chain. Ideally your organization should have some overall sense or full analysis of impacts in different areas to make informed decisions.

- **Which actions are feasible within the policy, influence and physical limitations** of your organization. For example, rooftop solar panels might not be feasible in a location with no rooftop space, while purchasing renewable energy might not be feasible where private energy purchase is not legally permitted, or a lack of leverage with key stakeholders like the petrochemical industry might make it challenging to address impacts.

- **Whether an activity is likely to ‘unlock’ other actions** – e.g. an evaluation of company or country impacts, an on-site audit of potential investment opportunities, a reversal of a key legal barrier to activity, or infrastructure that unlocks impact reduction – for either your organization or your value chain partners.

- **Whether there are any potential trade-offs that could be problematic** based on the specific situation, if there are important sustainability disadvantages to implementing an action, e.g. a major increase in impacts in another area, or social trade-offs. This should ideally be based on a systems analysis of your organization’s structure and dynamics as well as an analysis of sustainability impacts. Engagement with key stakeholders should be prioritized when developing actions to avoid unintended consequences.

- **The outcomes of consultation with relevant and credible stakeholders** – e.g. NGOs, technical organizations, workforce, affected communities, suppliers, consumers, citizens – and what they would prioritize for your organization.

- **Practical implementation resources required and financial factors** such as available capital and return on investment. These should be considered as a secondary factor after the potential scale of impact of an action, but ‘low-hanging fruit’ with low implementation costs and positive impacts can be implemented immediately compared with large investments that might take more time to authorize or obtain investment for. If you are an SME, smallholder or another actor with lower access to capital, you might find that high-cost activities are not feasible without non-commercial financial support from another actor and thus you should prioritize identifying this financial support wherever possible.

- **The availability of collaboration mechanisms and resources** for a specific action – e.g. collective programmes that can be joined or supported, forums where issues can be raised, funding sources that could be applied for, collective advocacy or influencing opportunities – that can help to deliver either internal or industry-wide solutions.

- Based on all of these factors, you can review the relevance of the actions below – or identify additional actions – to create your own plan for circular and sustainable textiles. The Roadmap report recommends prioritizing **upstream and holistic actions**, such as on product design, business models or changing aspirations.
This requires a significant shift in perception of what ‘value’ means for consumers, brands and retailers. The focus must be placed on shifting the market and business revenue away from linear models towards circular models that have demonstrated environmental and social impact reduction across the life cycle, or focusing on selling experiences or other non-material goods rather than physical products.

Create innovative business models that address key impacts and risks within the textile value chain that are also profitable and scalable, including models that focus on sharing, reuse, resale and longevity. These models should focus on consumers’ desired engagement with textiles (i.e. meeting physical and emotional needs), ensuring that they can be met in new, creative ways, particularly reflecting local identity and infrastructure context for the relevant country or region.

Create new solutions and models for fibre-to-fibre textile recycling and resale of post-consumer textile products, with a particular focus on solutions for collection, sorting, management of product information and data on available resources, as well as innovations in recycling technology.

Explore the role of under-served but strategic markets such as workwear and public procurement in establishing new business models.

Evaluate the barriers to full scale-up of innovative solutions in consumer markets or the supply chain and work collectively with policymakers, financial institutions, producers and brands to address these barriers through knowledge-sharing, financial incentives and innovative financial mechanisms, as well as adaptation to the needs of the market.

Evaluate the barriers to consumer take-up of innovative models and engage with marketing specialists to understand solutions; for example, through using specific messaging or framing of a circular customer offer.

Work with technical organizations to create a global due diligence process to understand potential benefits and trade-offs of innovative circular business models, such as reduced energy or resource use, increased logistics impacts, access issues or job gains and losses. Include calculations around the substitution effect (displacement rate) of alternative models to demonstrate avoided impacts and consider supporting market research to measure participation in existing solutions, e.g. rental, resale and the proportion of overall consumption behaviour for which this accounts. Include key principles to observe, e.g. only recycling when reuse is not possible.

A significant decrease in overconsumption is required, particularly in developed countries. This can be achieved through a combination of increased clothing utility (how long a product is used) and shifting consumer norms and aspirations towards lower consumption through engagement with the social and emotional aspects of behaviour. Reducing overproduction will be important for brands and retailers, and can be achieved through improved stock and demand management, as well as exploring new models such as on-demand production.

Create new solutions for brands and retailers seeking to reduce overproduction, including:
- mechanisms for on-demand production or customized ordering processes;
- technology to support efficiency and accuracy in demand forecasting, stock allocation and production cycles;
- solutions to improve customer offers, such as increased accuracy of clothing size guidance.

Create new solutions to reduce overconsumption, including:
- digital offers to reduce the need for physical samples, trying on clothes or even replacing some physical clothing sales;
- alternative methods for customers to experience brand value, including experiences, content and other alternative methods to provide emotional value and novelty;
- innovative solutions to repair, customization and other mechanisms for supporting continuing product use and adding novelty and expression to existing items.

Create new solutions to reuse products that still have a usable lifespan through the effective collection and sorting of post-consumer items. This can be achieved through optimizing existing waste streams or creating additional channels to collect and manage waste.
Design must be informed and intentional. Improved data and feedback loops will be critical to take into account knock-on effects of design at each stage of production, use and end of use. Products should be designed to consider the relevant circular business model (e.g. durability for rental), and with the assumption that they will be an input to closed loop recycling:

Create innovative designs that address key impacts and risks within the textile value chain and provide something exciting or valuable to the customer that can be brought to full market scale; for example, multi-use or modular designs.

Engage directly with design teams in brand and retail companies to share information about design innovations and support in-house teams to design in ways that support circularity outcomes for recyclers, e.g. encourage designing for recyclability including using mono-materials and high-quality raw materials to optimize reuse potential. The same approach should be applied to design for disassembly, e.g. threads that dissolve when heated.

Prioritize design for reuse – including physical and emotional longevity to ensure that products last and remain relevant and attractive to their user – and link design to business model to ensure appropriate solutions, e.g. products that can withstand cleaning for rental models, are adaptable for ownership models or have good resale value for a multi-user lifecycle.

Leverage innovative circular design to design out major impacts in the production and use phases.

Provide input into shared research and programmes to address design barriers to fibre-to-fibre recycling, including working to identify the most common challenges in the design of textile inputs to recycling systems.

Work with technical organizations to create a shared set of metrics for lower impact and circular design solutions and identify mechanisms to independently evaluate the benefits of innovative design solutions, such as a recyclability index.

Work with other innovators and recyclers to create innovation hubs around the world and create pre-competitive design collaborations and solutions.

Better product care reduces impacts and improves product durability

The consumer 'use' phase for textiles has chemical, energy, and water impacts, alongside microfibre and product durability issues. However, most textile brands do not include the consumer use phase in their impact evaluations and there are no large initiatives working on this phase. There is especially a need for more data on product care impacts and behaviour, also considering that consumers are diverse and global:

Work with a range of stakeholders – including white goods manufacturers, FMCG companies and the laundromat industry – or independently to create innovate product care technologies to reduce use phase impacts for a range of textile products.

Create innovative solutions around garment longevity, such as repair and refurbishment offers, particularly considering ease of use and consumer incentives.

Link use phase care choices and longevity to existing innovative business models and creating optimal results, such as engaging customers to care for rented or potential resale items in the correct way or optimizing impacts from in-house product care for rental services.

Evaluate the barriers to scaling up innovative use phase and longevity solutions and work collectively with communications specialists, policymakers, financial institutions, producers and brands to address these challenges through consumer outreach, market incentives and adaptation to customers’ needs.

Engage with technical third parties to ensure that innovative use phase claims are substantiated, potential environmental or social risks in the proposed approach are identified and addressed and results are benchmarked against appropriate comparative solutions, taking account of real consumer behaviour.

Draw on existing or new data from third-party technical organizations and governments to identify opportunities around use phase innovation, with a focus on solutions that offer reduced impact from energy and water use as well as reduced chemicals of concern and microfibres.
<table>
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<tr>
<th>5</th>
<th>The textile value chain drives resource efficiency and eliminates production pollution, production waste, on-site fossil fuel use and chemicals of concern</th>
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<tr>
<td>This includes collaborating with less-developed countries and previously marginalized communities, including – but not limited to – women, young people, indigenous and tribal peoples and persons with disabilities, which will help to avoid significant trade-offs and negative consequences:</td>
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<tr>
<td>Draw on existing resources from technical organizations such as Sustainable Apparel Coalition, Apparel Impact Institute, ZdHC and others to identify existing options for more sustainable and efficient production processes and choices and understand what levels of performance you should look for in producers working on more sustainable and circular products.</td>
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<td>Create innovative solutions to value chain technical challenges, including:</td>
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<td>- scaling of renewable energy and addressing high heat energy needs;</td>
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<tr>
<td>- elimination of chemicals of concern and pollutants (including addressing microfibre and water quality issues through capture and water treatment), chemical extraction and recycling;</td>
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<td>- on-site water recycling technologies;</td>
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<td>- methods for minimizing and reusing production waste.</td>
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<th>6</th>
<th>A just transition with skilled, safe, and empowered people takes place and social issues in the textile value chain are addressed</th>
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<tr>
<td>Carry out detailed due diligence and risk assessment processes to understand the potential social and labour risks within existing or proposed new value chains and processes. Ensure that all actors across the business and supply chain of innovators and recyclers – e.g. in raw materials production and manufacturing or collection, sorting and recycling – are paid a decent wage and provided with decent working conditions.</td>
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<tr>
<td>Identify potential social trade-offs in proposed alternative models and processes to understand whether any communities will be disadvantaged by new approaches. Create inclusive plans to consult with and support any affected stakeholders.</td>
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<tr>
<td>Ensure that a range of communities, stakeholders, regions and demographics are consulted in project development, design and sourcing decisions. Ensure that solutions do not actively exclude important groups in both the supply chain and its customer base.</td>
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<td>Consider economic access to innovative solutions and make price points accessible while also reflecting the potential increase in costs for more sustainable and circular offers.</td>
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<th>7</th>
<th>Textile raw materials are shifted to sustainable or recycled sources</th>
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<tr>
<td>There is a need to rapidly scale new and more sustainable production and cultivation practices for virgin raw materials, and to mainstream fibre-to-fibre recycling through improved practices as well as investment in waste management systems and infrastructure.</td>
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<tr>
<td>Explore potential technical solutions around harvesting, renewable energy and crop management, low-impact production of cellulosic and synthetic fibres and innovative fibre feedstocks with verifiable social and environmental benefits.</td>
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<tr>
<td>Support innovation to produce higher-quality virgin materials for product longevity and future recycling benefits.</td>
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<tr>
<td>Engage directly with brand and retail companies and producers to align the needs from both sides around quality, availability, performance properties and recyclability characteristics for innovative raw materials, while sharing these details in a consistent global framework.</td>
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<tr>
<td>Draw on existing resources from technical organizations such as Textile Exchange and credible certification schemes to identify existing options for sourcing sustainable raw materials within innovative business models and designs.</td>
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<tr>
<td>Evaluate the barriers to fully scaling up innovative raw materials in the textile value chain and work collectively with policymakers, financial institutions, producers and brands to address these challenges through knowledge-sharing, financial incentives and innovative financial mechanisms, while adapting the needs of the market.</td>
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<tr>
<td>Engage with technical third parties to ensure that innovative raw material claims are substantiated, potential environmental or social risks in the proposed approach are identified and addressed and results are benchmarked against appropriate comparative fibres, particularly focusing on demonstrating benefits through life cycle assessments or other credible third-party impact assessment, especially for chemically recycled materials that can have a stronger impact than virgin fibres.</td>
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<td>Explore verification options of waste sources used in recycling (type, source, collection processes) to avoid improper product/fibre claims and use certification to verify sources and processes.</td>
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<tr>
<td>Provide input into shared research and programmes to address barriers to fibre-to-fibre recycling, including transparently sharing data on recycling volumes, processes and lessons learned.</td>
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Significant improvements in shared infrastructure are made globally for a sustainable and circular textile value chain. This includes renewable energy, waste management and water treatment, as investment in shared infrastructure is essential to unlock the potential of individual actors to make changes in their own systems:

Create innovative solutions to shared infrastructure challenges, including:
- innovative renewable energy technologies and solutions for grid-scale or local network off-takers;
- improved technical solutions for shared water treatment infrastructure, such as energy and chemical efficient processes or solar-powered processes, new filtration technologies or new models for funding;
- improved municipal waste management processes, including collection, sorting, data management and processing.

Shifting consumer behaviour and global dynamics are required to avoid the need for landfill and incineration, for example, through circular solutions that reduce waste outputs. Solutions are needed to avoid shifting responsibility for waste disposal, such as trade of used textiles to locations that cannot use them and lack the infrastructure to adequately process textile waste:

Explore specific technical solutions to major challenges, including:
- supporting infrastructure for sorting and recycling to reduce material loss and achieve a higher quality and thus amount of raw material;
- creating technical innovation in separating blends;
- creating new technologies to ensure that recycled materials reach the same quality level as conventional fibres;
- addressing recycling challenges from chemicals of concern; for example, through the use of innovative alternative chemicals;
- considering the role of short fibres and dust to free into recycled materials.

Map and indicate clear needs from other actors to accelerate recycling technologies and volumes of fibre-to-fibre recycled materials.

Focus R&D into new recycling technologies and evaluating best practices, e.g. national or export recycling processes and systems, clothing collection, sorting and recycling.

Seek solutions to legacy problems – such as chemicals in products from previous years or even decades – and for the systemic transformation of material flows rather than small-scale innovation.

## INTERNAL AND EXTERNAL COORDINATION

Coordination is crucial in achieving a sustainable and circular textile value chain. Coordination actions that cut across all building blocks are outlined below.

### Build internal capacity and systems
- Ensure that your organization has in-house capacity on sustainability and circularity and is keeping pace with the relevant development of concepts, data, standards and best practices.
- Encourage design, engineering, business and creative teams to collaborate with internal and external experts on sustainability and circularity from the start of project processes, so that sustainability teams are not forced to shut down or create challenges for an existing project.

### Coordinate with other value chain stakeholders
- Work with technical organizations, brands and financial institutions to scale funding for R&D in the textile space and provide support in scaling successful innovative designs.
- Explore solutions for verifying impacts and processes for smaller or early-stage companies.
- Ensure that recommended solutions are scalable and feasible for all actors in the value chain, taking account of different conditions in each production and consumption market and ensuring accessibility for all business sizes (e.g. SMEs), while ideally aiming for cost-neutral solutions.
- Work with technical organizations, brands and financial institutions to scale funding for R&D in the textile space and provide support in scaling successful innovative business models.
- Explore collaboration with more traditional brands and retailers, e.g. using overstock from luxury brands for rental services.

This document is intended for innovators and recyclers within the textile value chain; for the full report, as well as annexes for other stakeholders, please visit: [www.unep.org/resources/publication/sustainability-and-circularity-textile-value-chain-global-roadmap](http://www.unep.org/resources/publication/sustainability-and-circularity-textile-value-chain-global-roadmap).

For more information on UNEP’s ongoing work on textiles, please visit [www.unep.org/sustainabletextiles](http://www.unep.org/sustainabletextiles).

**Endnotes**