

# Sustainability and Circularity in the Textile Value Chain

A Global Roadmap



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The review process highlighted that there is a plethora of relevant work ongoing in the textile sector. UNEP did a first mapping in its report "Sustainability and Circularity in the Textile Value Chain: Global Stocktaking." Rather than including another list in this report – which runs the risk of being outdated quickly – UNEP is maintaining a webpage under the "[One Planet network](#)", which highlights key projects and initiatives on the topic. If you would like to submit an initiative to this list, please follow the instructions on the relevant page.

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# **Sustainability** and **Circularity** in the **Textile Value** **Chain**

*A Global Roadmap*

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# Acronyms & Abbreviations

<b>Aii</b>	Apparel Impact Institute
<b>BCG</b>	Boston Consulting Group
<b>BGMEA</b>	Bangladesh Garment Manufacturers and Exporters Association
<b>BSR</b>	Business for Social Responsibility
<b>CLP</b>	Closed Loop Partners
<b>CMT</b>	Cut, make, trim
<b>COP</b>	Conference of the Parties
<b>EMF</b>	Ellen MacArthur Foundation
<b>EPR</b>	Extended producer responsibility
<b>ESG</b>	Environmental, social and governance
<b>GACERE</b>	Global Alliance on Circular Economy and Resource Efficiency
<b>GDP</b>	Gross domestic product
<b>GFA</b>	Global Fashion Agenda
<b>GHG</b>	Greenhouse gas
<b>GMO</b>	Genetically modified organism
<b>ICMA</b>	International Capital Market Association
<b>IFC</b>	International Finance Corporation
<b>ILO</b>	International Labour Organization
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>LCA</b>	Life cycle assessment
<b>MRSL</b>	Manufacturing Restricted Substance List
<b>MSME</b>	Micro, small and medium-sized enterprise
<b>NGO</b>	Non-governmental organizations
<b>OECD</b>	Organization for Economic Co-operation and Development
<b>PEF</b>	Product environmental footprint
<b>PET</b>	Polyethylene terephthalate
<b>ROC</b>	Regenerative Organic Certified
<b>ROI</b>	Return on investment
<b>SAICM</b>	Strategic Approach to International Chemicals Management
<b>SBTN</b>	Science Based Targets Network
<b>SDGs</b>	Sustainable Development Goals
<b>SME</b>	Small and medium-sized enterprise
<b>UNEA</b>	United Nations Environment Assembly
<b>UNECE</b>	United Nations Economic Commission for Europe
<b>UNECOSOC</b>	United Nations Economic and Social Council
<b>UNEP</b>	United Nations Environment Programme
<b>UNESCO</b>	United Nations Educational, Scientific and Cultural Organization
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>WRI</b>	World Resources Institute
<b>WWF</b>	World Wildlife Fund
<b>ZDHC</b>	Zero Discharge of Hazardous Chemicals



## Foreword

**The textile sector is woven into our daily lives – it provides high levels of employment<sup>1</sup>, generates \$1.5 trillion in revenue<sup>2</sup>, and provides products essential to human welfare.**

It is however also a sector struggling to address its impacts, including significant natural resource use and pollution, with 215 trillion litres of water consumed per year<sup>3</sup>, and 9% of annual microplastic losses to oceans<sup>4</sup>. This sector is contributing to the triple planetary crisis of climate change, nature and biodiversity loss, and pollution and waste. A crisis which is exacerbated by the way in which we produce and consume, and the textile sector is significant in driving unsustainable patterns of both, with consumers using items 36% less before discarding compared to 15 years ago, and the equivalent of a garbage truck full of clothes being thrown away every second<sup>5</sup>.

For the textile value chain, which is interconnected, complex, and global, 'shifting the needle' means creating a systemic change guided by science with a common destination of circularity. The roadmap towards sustainability and circularity sets out a route for better and more coordinated delivery for each stakeholder to reach this shared destination. The roadmap should bring about three core changes: a shift in consumption patterns; an improvement of practices when it comes to production processes, product design and care, and a just transition; and a significant investment in infrastructure. A sector known for its creativity and interconnection must

leverage this to co-create a future that designs for circularity, but also designs out the negative environmental, gender, and social impacts of the past linear system.

Circularity requires a fundamental shift in how we value business models, textile products, workers, production processes, and natural resources. And the opportunities associated with this shift are substantial; a transformation towards circular textile business models could generate \$700 billion in economic value by 2030<sup>6</sup>, while each 1 per cent increase in market share of circular business models is likely to reduce emissions by 13 million tCO<sub>2</sub>e<sup>7</sup>. The need to shift to more sustainable consumption and production patterns and incorporate circularity into economies is also supported by the Fourth and Fifth Session of the UN Environment Assembly.

The findings of this report inform UNEP's Textile Flagship Initiative that works to deliver global systemic change through a coordinated and collaborative approach within the United Nations Secretariat and beyond. The path forward is clear, and all ambitions must rise to meet it. UNEP calls for all textile stakeholders to walk this same path together; it is only by collaborating and taking joint action that the transformation we need can happen.



**Sheila Aggarwal-Khan**

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UN Environment Programme

1 UNEP (2020) Sustainability and Circularity in the Textile Value Chain: Global Stocktaking.  
2 Statista (2022). Revenue of the apparel market worldwide from 2014 to 2027.  
3 Quantis (2018). Measuring Fashion: Environmental Impact of the Global Apparel and Footwear Industries.  
4 UNEP (2018). Mapping of Global Plastics Value Chain and Plastics Losses to the Environment: with a Particular Focus on Marine Environment.  
5 EMF (2017). A New Textiles Economy: Redesigning Fashion's Future.

6 EMF (2021a). Circular Business Models: Redefining Growth for a Thriving Fashion Industry.

7 McKinsey and GFA (2020). Fashion on Climate.



## Executive Summary

**The textile sector plays a key role in driving industrialization, trade, development and social value. It rapidly develops regional and global value chains by connecting producers, retailers and consumers from across the world.**

It is also a sector struggling to address its contributions to the triple planetary crisis on climate change, nature loss and pollution. Every year, the textile sector emits 2-8% of the world's greenhouse gases, uses the equivalent of 86 million Olympic-sized swimming pools of natural water resources, and is responsible for 9% of microplastic pollution to our oceans. Additionally, the value chain has deep social impacts, with textile workers at risk of exploitation, underpayment, forced labour, health risks and abuse. Women are particularly vulnerable as they represent an average of 68% of the garment workforce, and 45% of the overall textile sector workforce.

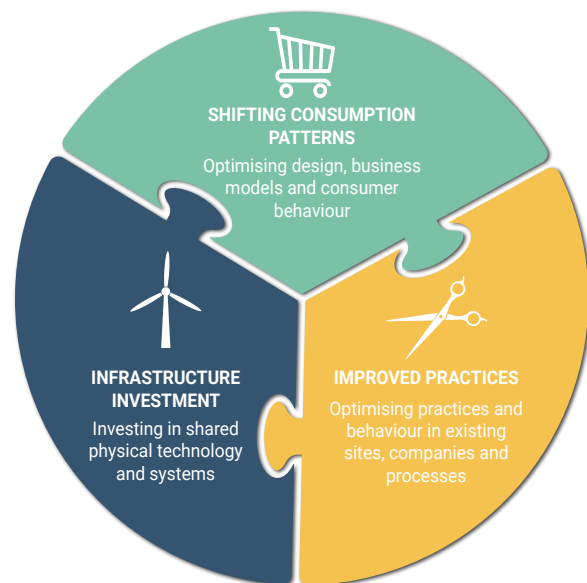
Transforming the textile value chain into one that is sustainable and circular will allow us to address these environmental and social impacts, while also supporting people, prosperity and equity. However, no single group of actors can achieve this scale of sector transformation alone, but rather it requires all stakeholders to use their resources and efforts to work together towards a common goal.

In order to prioritize effective action for all stakeholders and encourage collective engagement, this report applied a systemic value chain approach. Building on research and consultations with over 140 textile value chain stakeholders, it defines a common agenda of transformation towards sustainability and circularity.

These priorities are interconnected and require a coordinated approach by all value chain actors. For example, a focus on shifting consumption patterns – how products are designed, what kind of business

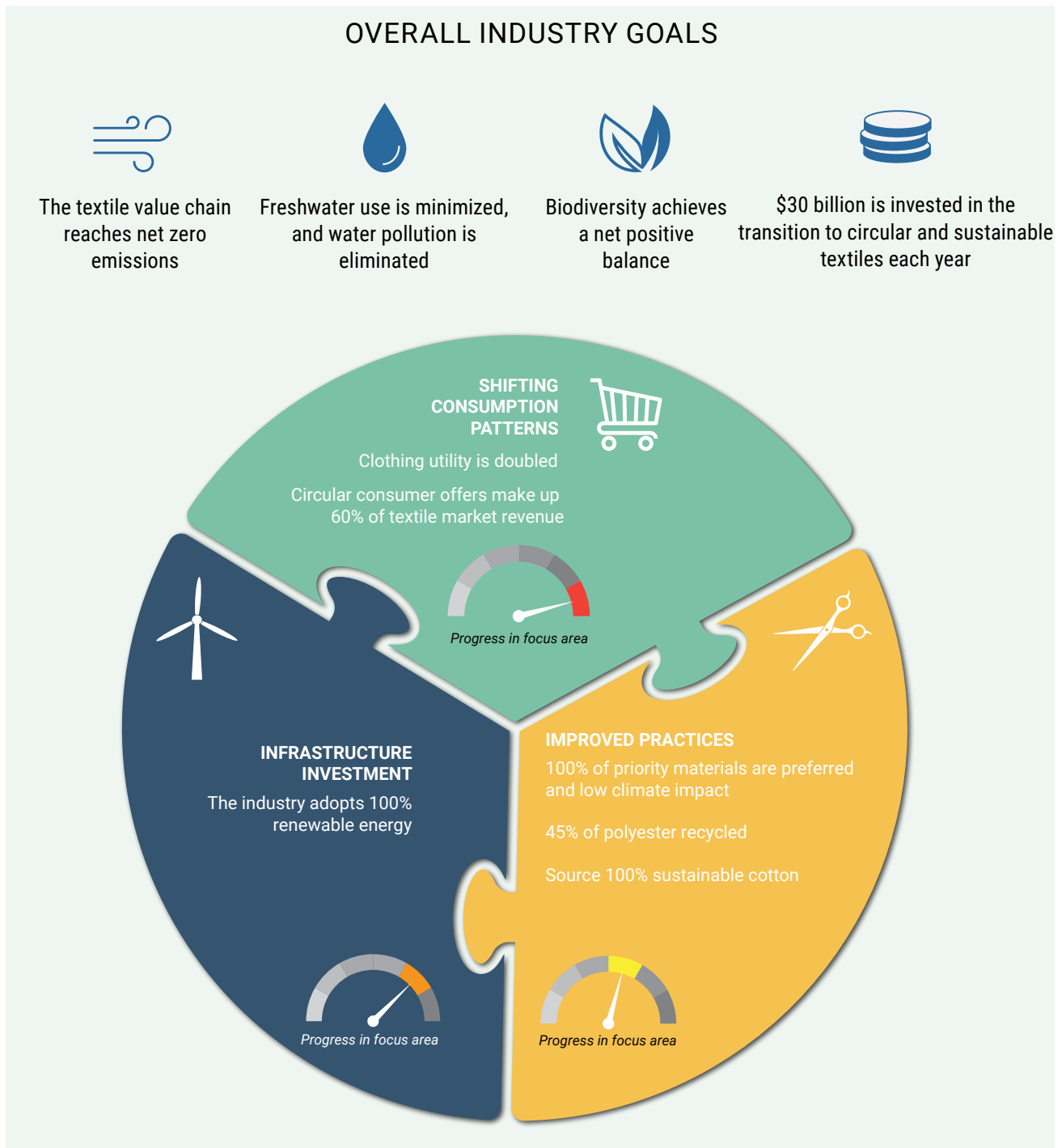
models are offered to consumers and how aspirations are set – could radically reduce pressure on the production system (e.g., reducing the need for raw materials by extending the use phase of products).

Several initiatives have set ambitious goals to shift towards a sustainable and circular textile value chain, although progress on their delivery is often slow due to the scale of the challenge, the complexity of the value chain, the lack of system-level policy, technical and financial barriers and the fragmentation of stakeholders beyond a small number of sustainability-minded multinational brands.



**Executive Summary Figure 1:** Three priorities to deliver system change in the textile value chain

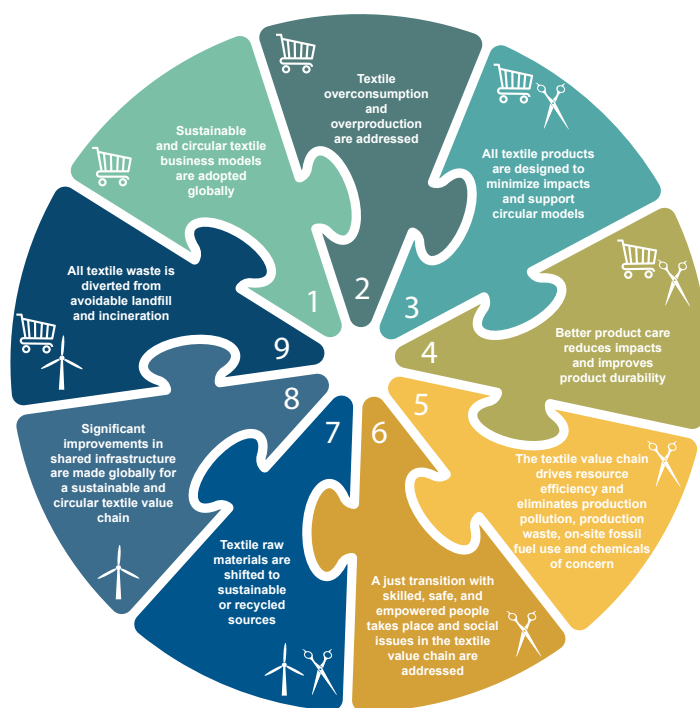
**THE THREE PRIORITIES TO DELIVER SYSTEM CHANGE ARE SHIFTING CONSUMPTION PATTERNS, IMPROVED PRACTICES AND INFRASTRUCTURE INVESTMENT**



**Executive Summary Figure 2:** Existing quantified industry goals for a sustainable and circular textile value chain

Within the three priorities, the roadmap proposes nine 'building blocks' that shape a sustainable and circular textile value chain. The building blocks address the key drivers of environmental and/or socio-economic impacts ('hotspots') within the value chain, support

the delivery of the existing industry goals, and require multiple stakeholders to act together. The report identifies the priority actions that each stakeholder group can take to deliver against the building blocks.



Executive Summary Figure 3: Nine building blocks needed to deliver the three priorities

Shifting Consumption Patterns	1	<b>Sustainable and circular textile business models are adopted globally.</b> 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 impact reduction in both production and use phases, or focusing on selling experiences or other non-material goods rather than physical products.
	2	<b>Textile overconsumption and overproduction is addressed.</b> A significant decrease in unnecessary consumption 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 unnecessary production 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.
Shifting Consumption Patterns + Improved Practices	3	<b>All textile products are designed to minimize impacts and support circular models.</b> 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.
	4	<b>Better product care reduces impacts and improves product durability.</b> 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.
Improved Practices	5	<b>The textile value chain drives resource efficiency and eliminates production pollution, production waste, on-site fossil fuel use and chemicals of concern.</b> Textile production sites – especially wet processing sites – require major support and investment to substitute machinery and apply circular production methods. This is particularly important for sites beyond tiers 1 and 2 of large multinational brands, or production countries without strong policy enforcement on cleaner production.
	6	<b>A just transition with skilled, safe, and empowered people takes place and social issues in the textile value chain are addressed.</b> 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.
Improved Practices + Infrastructure Investment	7	<b>Textile raw materials are shifted to sustainable or recycled sources.</b> 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.
Infrastructure investment	8	<b>Significant improvements in shared infrastructure are made globally for a sustainable and circular textile value chain.</b> 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.
Infrastructure Investment + Shifting Consumption Patterns	9	<b>All textile waste is diverted from avoidable landfill and incineration.</b> 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.

Many stakeholders are dependent on others to create enabling conditions for action, and no single stakeholder group alone holds the key to reach a sustainable and circular textile value chain. Therefore, one of the most important actions that stakeholders can undertake is to join collective dialogue and activities.

However, there is also a role for each stakeholder to take action within their own sphere of influence. Alongside opportunities for collective action, this report highlights some individual opportunities for a range of stakeholders, identifying the following priorities for each:



#### **Brands and retailers**

- create revenue in a more sustainable way and dematerialize business value through new business models
- prevent problems at the design stage instead of trying to solve them later through design for low impact and circularity
- make decisive business improvements based on science-based evidence to reduce environmental and social impacts



#### **Policymakers**

- raise ambitions and implement new sustainable and circular policy instruments
- invest in the transformation and match funding flows to intentions
- think holistically about the impact of policies, consult widely on policy design and implementation, and coordinate key stakeholders to set ambitious and effective sustainability policy



#### **Raw materials producers and manufacturers**

- identify and implement the best technical practices for production sites and prioritize on-site improvements and innovation for environmental impact reduction
- protect, invest in and empower workers, and work together to address shared barriers
- benefit from symbiotic opportunities and drive system change



#### **Financial institutions**

- understand and address the actual investment needs of diverse stakeholders in the transition to sustainable and circular textiles and address systemic funding barriers
- build internal capacity, understand the details, and plan for the transition
- drive real innovation in solutions, processes and metrics, create innovative financial products and increase available funding for sustainable and circular solutions



#### **Innovators and recyclers**

- provide the solutions and innovations for change and create new circular offers and technologies
- create accessible and scalable solutions and ensure that solutions are adapted for multiple types of users and contexts
- be realistic and purposeful about scaling change in a challenging system, including planning for market realities



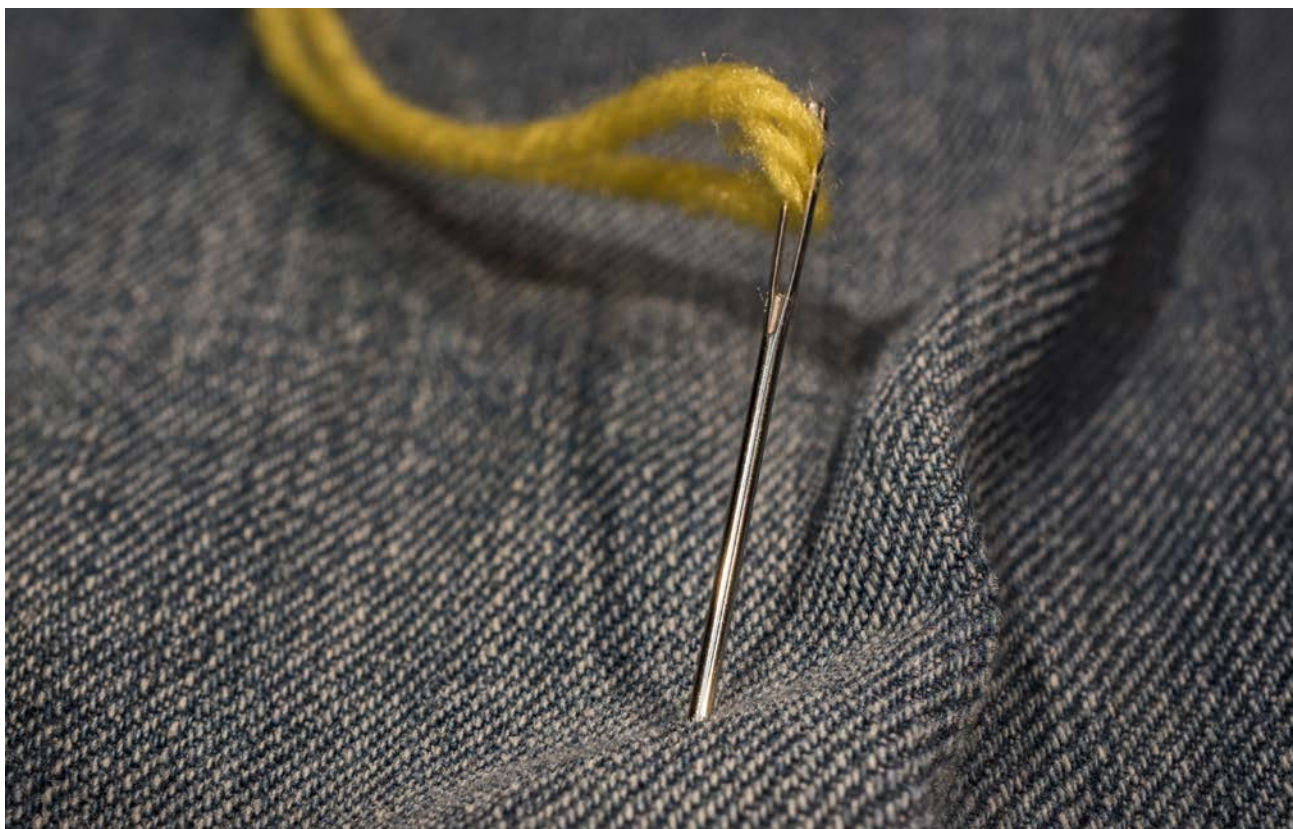
#### **Communication and consumer engagement actors**

- make behaviour change aspirational and reframe the narrative
- understand the complexities of 'the consumer' rather than assuming that all consumers are the same
- move as many people as possible away from the mindset of consumption being the norm



#### **Non-governmental, representative, and technical organizations**

- advocate for and support rapid action from the industry and policymakers, and drive ambition and improvements
- provide credible mechanisms, recommendations and data for prioritization and accountability
- address system-level barriers through convening stakeholder collaboration



## WHAT COMES NEXT?

Implementing the priorities identified in this global roadmap will require an unprecedented degree of coordination, investment, regulation and business model adaptation but will also create new opportunities for all. All actors in the value chain must become part of the solution to develop and perpetuate a new model for the textile sector, based on science and in line with circularity principles.

While acknowledging that many organizations and initiatives are already working at the global level to help the sector to transition towards more sustainable practices, circularity and upstream innovations remain a gap. The need emerges to embed circularity principles as part of the sector ambition targets and foster coordination, improving cohesion in the delivery of existing initiatives, ensuring that all efforts pull in the same direction to achieve a greater, more harmonized and quantified impact.

This report underpins UNEP's Textile Flagship Initiative. Together with partners, UNEP will work to carry forward key recommendations, including leveraging its position to encourage coordination across the textile value chain towards circularity.



## 1

## Introduction

## 1.1 Background

**The textile sector is important to the global economy and drives industrialization, trade, development and social value.** The modern textile sector rapidly develops regional and global value chains by connecting producers, brands and retailers and consumers from across the world. The sector is also struggling to address its wide-reaching impacts, with unsustainable patterns of consumption and production creating a **triple planetary crisis of faster climate change, destroying nature and increasing pollution levels.**<sup>8</sup>

This report defines 'textiles' as all products that contain knit or woven textile components, primarily composed of apparel and footwear, but also including home textiles, technical, medical and automotive textiles, etc. **The textile value chain is estimated to be responsible for between 2 and 8 per cent of global greenhouse gas (GHG) emissions,**<sup>9</sup> as well as **significant pollution, water extraction and biodiversity impacts, including 215 trillion litres of water consumed per year (the equivalent of 86 million Olympic-sized swimming pools)**<sup>10</sup>, and **9 per cent of annual microfibre pollution to oceans.**<sup>11</sup> Environmental pressures on the industry place €110 billion of value at risk,<sup>12</sup> while addressing them could ultimately save companies \$54.1 trillion.<sup>13</sup> At the same time, the number of times that an item is used before it is discarded (textile utility) has decreased

by an estimated 36 per cent in the past 15 years.<sup>14</sup> The average United States consumer bought 69 garments per year in 2021,<sup>15</sup> compared to 40 in the 1990s. Every second, the equivalent of a garbage truck full of clothes is thrown away around the world, amounting to an estimated \$460 billion in total value.<sup>16</sup>

Workers in the textile value chain face exploitation, systematic underpayment, forced labour, severe health risks and verbal and physical abuse.<sup>17</sup> **By 2030, it is anticipated that there will be rising wage inequality between high- and low-skill workers on a global level, an insufficient number of high-skill workers, and a lack of low-skill roles.**<sup>18</sup> Women are particularly vulnerable as they represent the majority of the garment workforce and experience incidents of gender-based violence and harassment, with all surveyed garment workers in India directly experiencing or witnessing this gender-based violence and harassment first-hand.<sup>19</sup>

8 UNEP (2020). Triple Planetary Crisis: Forging a New Relationship between People and Earth.

9 This range accounts for a variety of studies that use different methodologies and data sources, for instance 2% according to WRI and Aii (2021), 4% according to McKinsey and GFA (2020), and 8% according to Quantis (2018).

10 This figure was derived by dividing the total volume of natural water resources used annually (215 trillion litres as per Quantis, 2018) by the volume of an Olympic swimming pool (estimated at 2.5 million litres) based on the dimensions from the International Swimming Federation, which is recognized by the International Olympic Committee as administering water sport international conditions. The dimensions were accessed at: [https://resources.fina.org/fina/document/2022/02/08/77c3058d-b549-4543-8524-ad51a857864e/210805-Facilities-Rules\\_clean.pdf](https://resources.fina.org/fina/document/2022/02/08/77c3058d-b549-4543-8524-ad51a857864e/210805-Facilities-Rules_clean.pdf) (accessed 22 December 2022).

11 UNEP (2021) Catalyzing Science-Based Policy Action on SCP: Task Group IRP - One Planet.

12 GFA (2017). Pulse of the Fashion Industry.

13 UNEP (2019). Global Environment Outlook – GEO-6: Healthy Planet, Healthy People.

14 The baseline for this number was 2017. EMF (2017). A new textiles economy: Redesigning fashion's future.

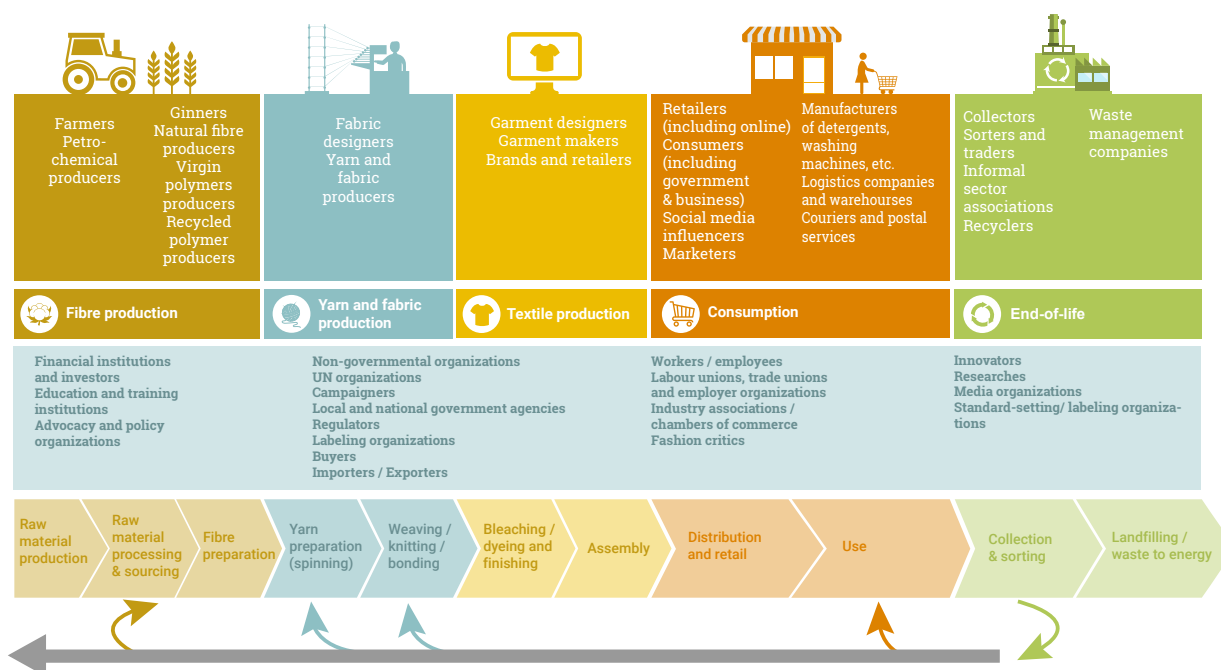
15 American Apparel and Footwear Association (2022). Apparel Stats & Shoe Stats 2022: Significant Industry Data.

16 Common Objective (n.d.). Volume and Consumption: How Much Does the World Buy?

17 Fashion Revolution (n.d.). Fashion's Future: The Sustainable Development Goals.

18 BSR and Laudes Foundation (2021). Keeping Workers in the Loop: Preparing for a Just, Fair, and Inclusive Transition to Circular Fashion.

19 Business Human Rights (2022). Unbearable harassment: The fashion industry and widespread abuse of female garment workers in Indian factories.

**Figure 1:** Stakeholders associated with the textile value chain

Source: UNEP (2020). Sustainability and Circularity in the Textile Value Chain: Global Stocktaking.

**The sustainability challenges of the textile value chain are predicted to continue to increase over time, with demand predicted to grow to \$2 trillion by 2027, with 63 per cent of the increase in demand over the next decade coming from emerging markets.<sup>20</sup> A large part of this significant consumption will come from the approximately 2-3 billion new middle-class consumers expected by 2050<sup>21</sup> from markets including China, India and the Middle East.<sup>22</sup> However, there are also signs of market shifts, with young 'Generation Z' consumers driving a shift towards resale markets, which are expected to grow 11 times faster than conventional selling models by 2025, attracting 118.8 million sellers.<sup>23</sup> By 2030, it is projected that the resale, rental, repair and remaking market could grow to from 3 per cent in 2021 (\$73 billion) to 23 per cent of the total textiles industry (or \$700 billion) by 2030, with resale composing 69 per cent of this economic value generated. In another study, 60 per cent of the top 50 global brands and retailers surveyed have offered (or are open to offering) second-hand items to their consumers.<sup>24</sup>**

Transforming the textile value chain to become circular is a unique opportunity to solve the three environmental crises of our time of climate change, biodiversity loss and pollution. Many initiatives and cross-industry platforms are working to reduce these impacts. From raw material cultivation to end-of-life waste, every stakeholder in the interconnected textiles global value chain can contribute sustainability solutions at every stage (see Figure 1). However, even accounting for existing goals and work, **the fashion industry is calculated to miss the 1.5°C pathway outlined in the Paris Agreement by 50 per cent<sup>25</sup> and it is estimated that additional investments of \$20–30 billion per year will be needed to pivot the textile value chain towards more sustainable pathways.<sup>26</sup>**

20 Statista (2022) Revenue of the apparel market worldwide from 2014 to 2027.

21 McKinsey (2020). Biodiversity: The next frontier in sustainable fashion.

22 Fashion Revolution (2020). Why We Still Need a Fashion Revolution.

23 thredUP (2021). Fashion Resale Market Report 2021.

24 GlobalData Fashion Retailer Survey: 50 US fashion (apparel, accessories, footwear) retailers were surveyed in March and April 2021 about their Circular Fashion goals.

25 McKinsey and GFA (2020). Fashion on Climate.

26 Fashion for Good and BCG (2020). Financing the Transformation in Fashion.



Addressing production impacts alone will not be sufficient to transform the industry in time. **Consumption must be a central pillar, and both the products and systems will need to be redesigned to make this shift a reality.**

Consumption has significantly exceeded meeting basic human needs in many regions, and is now associated with a perceived gain of social value. To address this, **a multi-pronged approach will be needed, from reducing the volume of new products purchased to examining how items are cared for and disposed of at their end of use.** To change consumption habits, the global public must be engaged with using the textile sector's well-developed communications engine to shape culture, ideals, aspiration and values to create a vision of what a new sustainable textiles future could be.<sup>27</sup> A sustainable transition for the fashion industry must also focus on a change in cultural narrative. UNEP's vision for sustainable fashion communication is: *"To build demand and inspire action for a positive fashion future, by changing the dominant narrative of the sector from one of extraction, exploitation and disposable consumption, towards regeneration, equity and care."*<sup>28</sup> It will be important to dematerialize business value and shift to circular and sustainable business models to create new opportunities. It will also be important to ensure that consumption mitigates potential trade-offs as much as possible to ensure a just transition that avoids the loss of livelihoods.

UNEP has created a series of reports to support a transition towards a more sustainable and circular textile value chain. **The first report – Sustainability and Circularity in the Textile Value Chain: Global Stocktaking – mapped the global value chain and brought together impact data from across the textile value chain to identify key hotspots of environmental and socioeconomic impact that most urgently need addressing.** It also took stock of existing initiatives that are already addressing those hotspots and identified gaps. This current report builds on this work by presenting the roadmap needed to achieve sustainability and circularity in the textile value chain. It does so by **outlining the building blocks that shape a sustainable and circular textile value chain and subsequently identifying and prioritizing actions each stakeholder group can take to contribute to this**

**transition**, as well as the global mechanisms needed to support stakeholders in scaling transformation.

**To create a roadmap that is both ambitious and achievable, UNEP consulted with 140 textile value chain stakeholders** including brands, producers, innovators, recyclers, policymakers, financial institutions, technical organizations, non-governmental organizations (NGOs), academics and communications experts, such as advertisers, consumer behaviour specialists and journalists. Stakeholders were identified from around the world to gather diverse perspectives and experiences, particularly from those in key production and consumption locations.

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It will be important to dematerialize business value and shift to circular and sustainable business models to create new opportunities. It will also be important to ensure that consumption mitigates potential tradeoffs as much as possible to ensure a just transition that avoids the loss of livelihoods.

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<sup>27</sup> In 2023, UNEP will publish The Sustainable Fashion Communication Playbook as an annex to this report that will provide deeper guidance on this element.

<sup>28</sup> UNEP (2021c). Sustainable Fashion Communication Strategy 2021-2024.

**Box 1: The role of individual consumers in this report**

This report examines the role of multiple stakeholders, including those actors that engage directly with consumers to share information and encourage behaviour change. However, individual consumers themselves have not been specifically allocated a chapter outlining the actions they should take.

This is not to underestimate how central individuals – in their role as citizens and as consumers – are to the transition. Individuals have an important role in changing behaviour towards sustainable lifestyles, although the duty to act should not be placed on them. Consumers are already signalling that they care about sustainability. However, consumers need access to affordable, effective and desirable options, convenient alternative systems and sufficient reliable information to make decisions. In essence, governments and companies have to be in the driving seat when it comes to rethinking, designing, delivering and enabling access to more sustainable solutions through policies, services and products and ensuring that everyone's needs are met.<sup>29</sup>

This report therefore focuses on creating a context that enables consumers to make more sustainable decisions, without waiting for consumers to change their behaviour for the industry to start acting. For example, a reduction of unnecessary consumption will require a change in how aspirations are set through advertising and media.

The report also recognizes the important work already under way by initiatives and organizations that target individuals. UNEP will work together with many of the partners who contributed to the report to translate its findings into messages that work for individuals and disseminate widely.

**1.2 How to use this report**

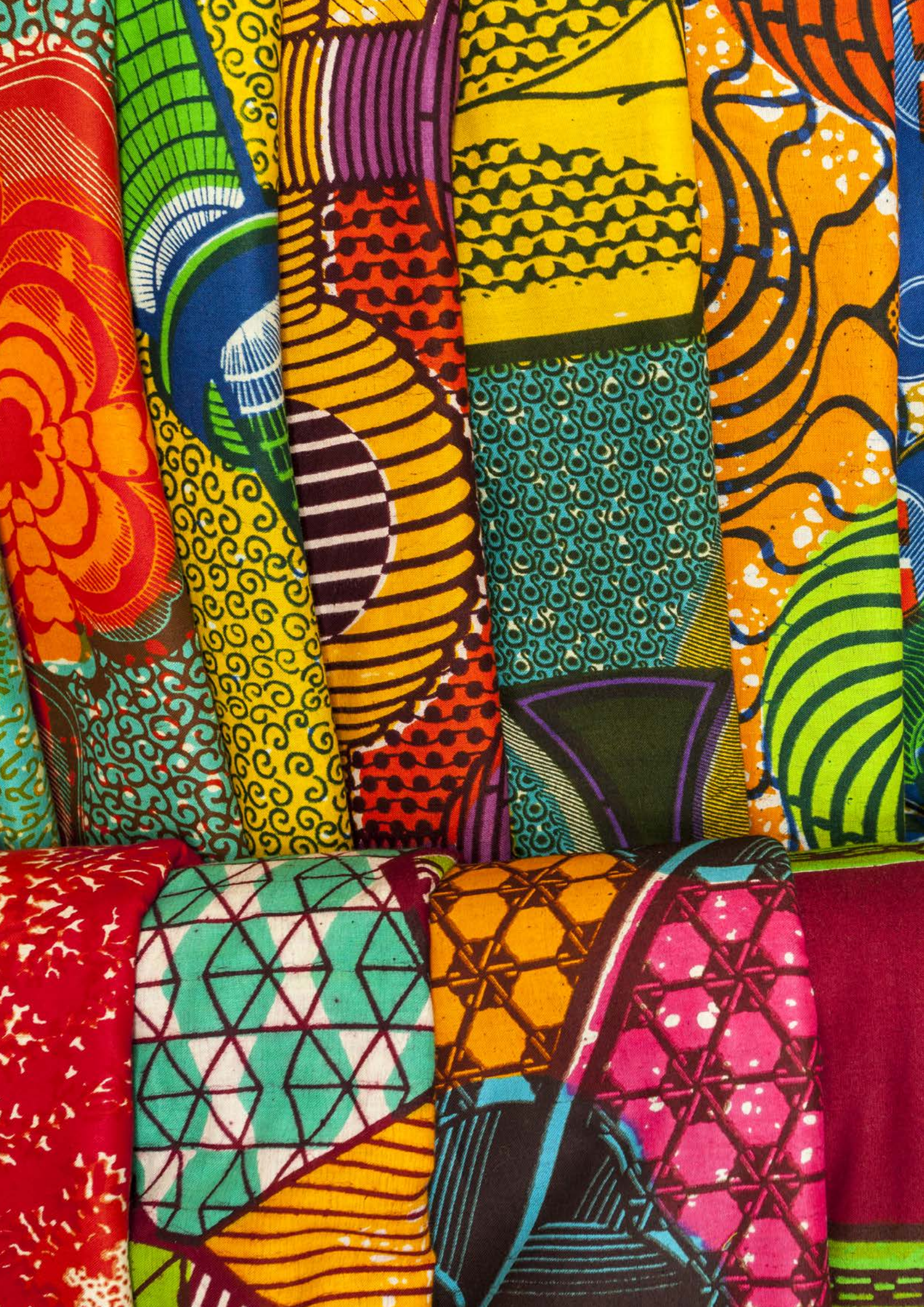
The main report is intended as a general summary of challenges, opportunities, solutions and next steps for a sustainable and circular textile value chain. It outlines nine building blocks that specifically explore the cross-stakeholder opportunities for change, and how collaboration can be facilitated to deliver them, highlighting examples of actions for those stakeholders that are most crucial or influential for each building block.

However, it is also important to recognize that each stakeholder group has a unique role and contribution to make to each building block in creating a sustainable and circular textile value chain, even if they are not highlighted in the main report. For this reason, the annexes associated with this document detail the opportunities and barriers, as well as actions for each of the key stakeholder groups identified. Each stakeholder group can read both the summary report, and the annex specifically developed for them. Other stakeholder annexes can be read for a more complete context.

This report provides examples of initiatives, commercial companies, products and other work that serve as an illustration of tackling different sustainability aspects, but should not be read as an endorsement by UNEP or an “end state” example of circularity in the textile value chain.

<sup>29</sup> UNEP (2020a). Emissions Gap Report.







# 2

## What do sustainability and circularity mean for the textile value chain?

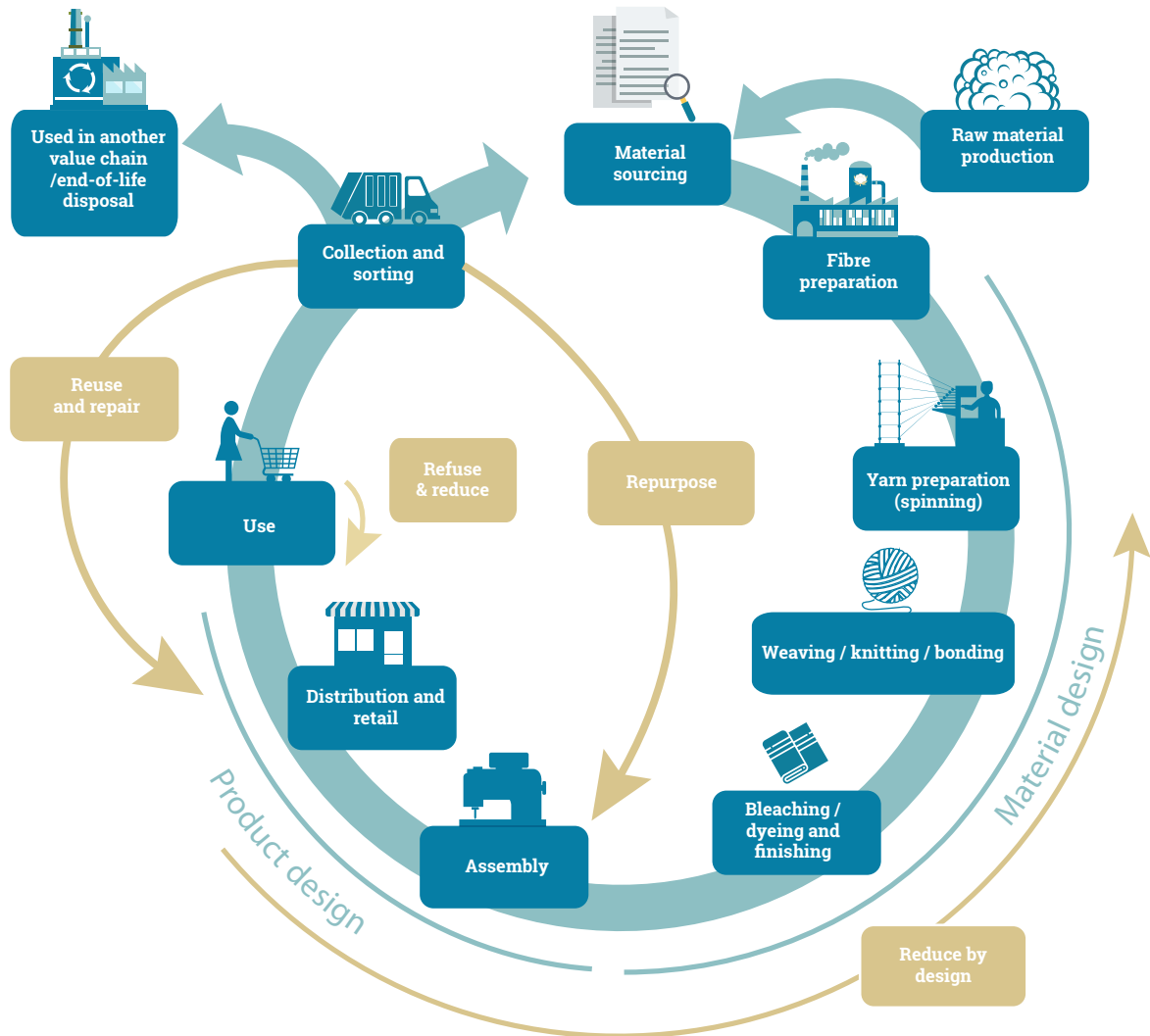
### 2.1 What do we mean by circularity in textiles?

As conceptualized in the [UNEP circularity platform](#), circularity provides a model to transform the current linear textile economic model towards a sustainable future. It requires governments, businesses, and consumers to look beyond the current “take, make and dispose” extractive industrial model and redefine growth, focusing on positive society-wide benefits. Circularity’s underlying objective is that materials should be kept at their highest possible value as they move and are retained as long as possible within the textile value chain. This reduces and disconnects the use of natural resources and environmental impacts from the economic activity of the textile industry, while continuing to enable improvements in human well-being.

UNEP’s circularity approach builds on nine value retention processes and an overarching ‘reduce by design’ approach. Circularity goes well beyond recycling fibres, and “reduce by design” aims to reduce the amount of material, particularly raw material, and hazardous chemicals consumed during production and during use from the very beginning of product and service conceptualization. Production and consumption patterns as well as end-of-life processes of textile products are optimized via innovative product designs and business models, resulting in not only eliminated harmful impacts and waste but also improved social protections and business resilience. Figure 2 illustrates what this looks like in the textile sector.

While a sustainable and circular textiles industry requires not only ‘closing the loop’ but also addressing overall consumption patterns and levels, it is important to recognize that some markets and population groups do not yet have adequate access to textiles. This topic is addressed in more detail in section 3.2.

**Figure 2:** Representation of activities in a circular textile value chain



Source: UNEP (2019). Circularity Platform.

Circularity is a means to achieving sustainable development and is central to the delivery of many of the Sustainable Development Goals (SDGs),<sup>30</sup> in particular SDG 12 (Responsible Consumption and Production).<sup>31</sup> This is also reflected in the resolution on enhancing circular economy as a contribution to achieving sustainable consumption and production, which was adopted at the United Nations Environment Assembly on March 2, 2022.<sup>32</sup> Sustainability practices are those that balance economic, social and environmental considerations. Many existing and ‘conventional’ sustainability initiatives in the textiles

space (such as those focusing on scaling energy efficiency) do not pursue circularity directly, and are working to incrementally reduce impacts from existing systems. However, even if circularity aims at a more radical redesign of systems, ‘conventional’ sustainability metrics (such as worker safety, gender, GHG emissions, or water impacts) should still be used to measure the outcomes (and success or potential trade-offs) of circular approaches. Within UNEP’s approach as applied in this report, circularity must ultimately provide improved environmental and social benefits compared to a linear model.

30 United Nations (n.d.). Sustainable Development Agenda.  
 31 International Resource Panel (2017). Resource Efficiency: Potential and Economic Implications.  
 32 UNEP (2022). Enhancing circular economy as a contribution to achieving sustainable consumption and production.

## 2.2 What is the value chain approach?

UNEP has adopted the value chain approach to advancing sustainability and circularity in the textile sector. This approach<sup>33</sup> anchors natural resource use and environmental impacts within the socioeconomic reality of production and consumption and uncovers actionable insights into how the management of resources relates to the 2030 Agenda for Sustainable Development. Taking a value chain approach implies looking not only at the physical processes (such as farms or factories) but also the way in which products and services are designed and developed, promoted, and offered to consumers ('consumers' being the individual purchasers and users of textile products globally).<sup>34</sup>

Critically, the approach goes beyond an understanding of where along the value chain resource use and environmental as well as socioeconomic impacts occur. By applying a systems lens, the value chain approach identifies the drivers and barriers that shape a value chain's operations. It includes the complex drivers and feedback loops that determine and influence the operations and behaviours of actors along the value chain. By engaging all actors along the value chain, the value chain approach identifies the most effective solutions and defines a common agenda for concerted actions that can transform the system. For this purpose, three steps are followed:

1. **Understand the value chain and identify sustainability hotspots;**
2. **Consolidate existing action and identify opportunities to address the identified hotspots; and**
3. **Define a common agenda and prioritize through a participatory process.**

UNEP's work on applying the value chain approach in textiles includes the 2020 report "[Sustainability and Circularity in the Textile Value Chain: Global Stocktaking](#)", which summarizes the efforts undertaken in steps (1) and (2). Building on those findings, this report corresponds to step (3), aiming to define the common agenda for the sector and identifying priority actions to address the determined gaps in a shared roadmap.

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By engaging all actors along the value chain, the value chain approach identifies the most effective solutions and defines a common agenda for concerted actions that can transform the system.

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<sup>33</sup> UNEP (2021). Catalysing Science-based Policy Action on Sustainable Consumption And Production.

<sup>34</sup> UNEP (2020). Sustainability and Circularity in the Textile Value Chain: Global Stocktaking.

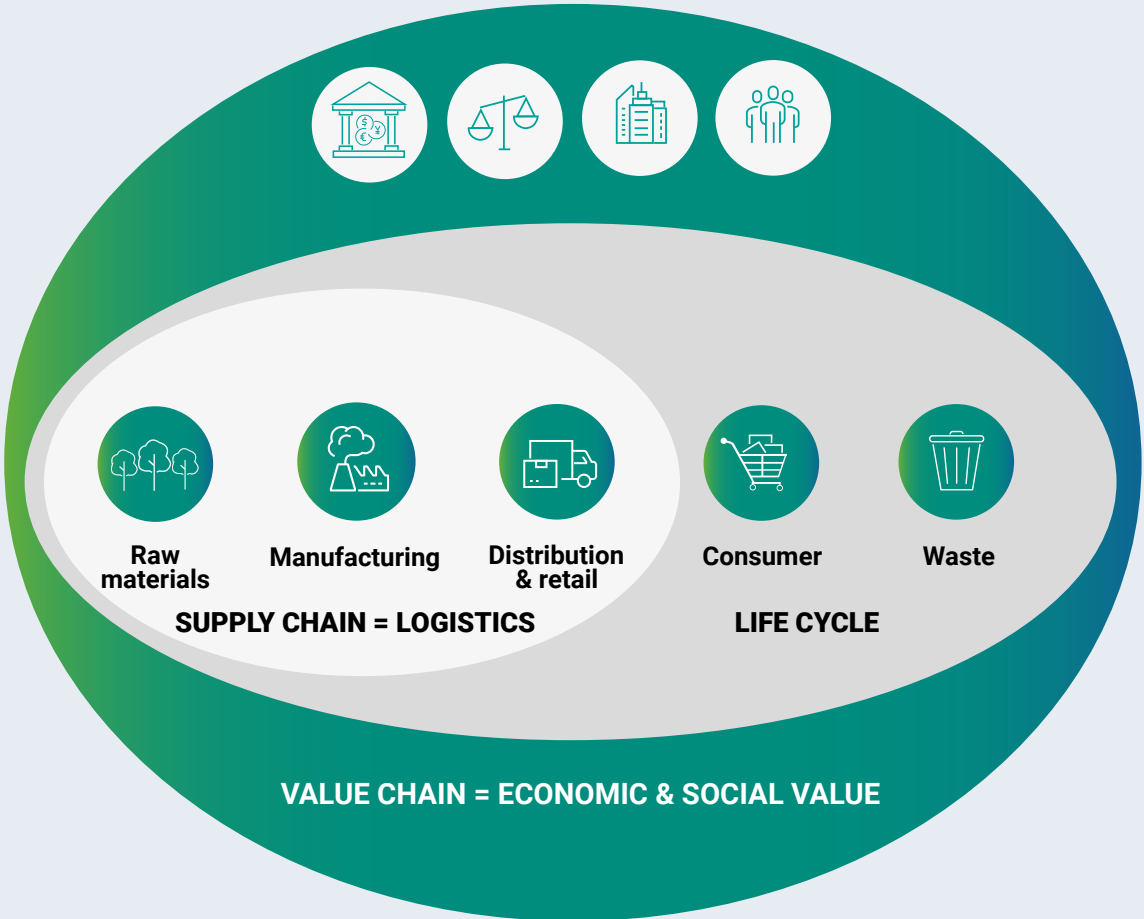
**Box 2: What do the terms ‘value chain’ and ‘supply chain’ mean?**

The textile value chain comprises all activities and stakeholders that provide or receive value from designing, developing, making, distributing, retailing, and consuming a textile product (or providing the service that a textile product renders), including the extraction and supply of raw materials, as well as activities involving the textile after its useful service life has ended. The value chain covers all stages in a textile product’s life, from supply of raw materials through to disposal after use, and includes the activities linked to value creation such as business models, consumption patterns, investments and regulation.<sup>35</sup> The value chain also comprises the actors undertaking the activities, and the stakeholders that can influence those activities.

The textile value chain is thus considered as a whole system that goes beyond the supply chain and the life cycle of products (see Figure 3).

For the textile value chain, it is common to distinguish the value chain stages as ‘tiers’, as outlined in Figure 4.

**Figure 3:** The value chain in relation to supply chain and lifecycle

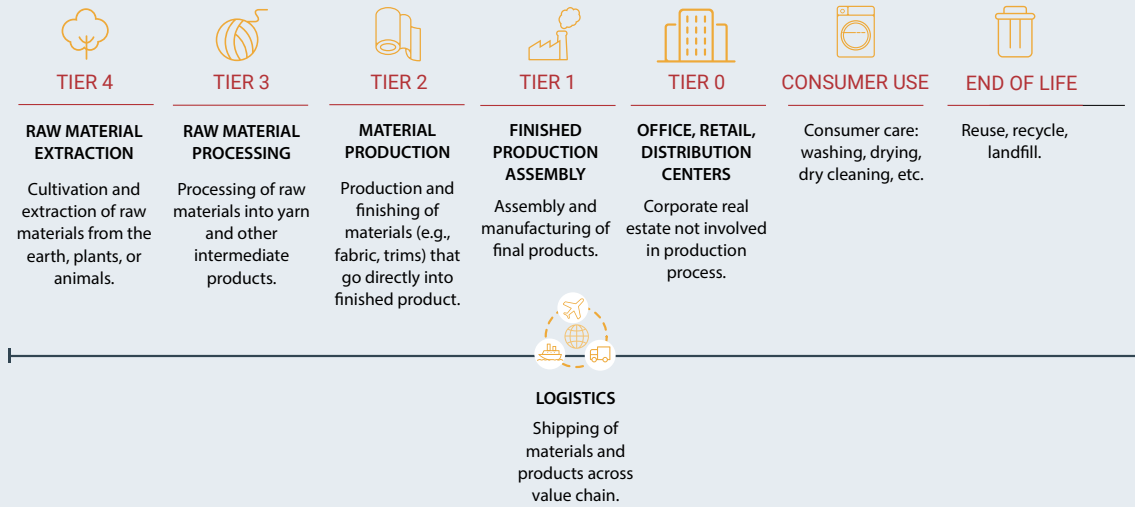


Source: United Nations Environment Programme (2021). Catalysing Science-based Policy Action On Sustainable Consumption And Production.

35 UNEP (2021). Catalysing Science-based Policy Action On Sustainable Consumption And Production.



**Figure 4:** The tiers in the textile value chain



Source: WRI and Aii (2021). Roadmap to Net Zero: Delivering Science-Based Targets in the Apparel Sector.

**What do the terms ‘textile industry’ and ‘fashion industry’ mean?**

The textile industry is the inclusive term for several industries, such as the ‘fashion industry’ or ‘garment and footwear industry,’ which is primarily producing clothing and apparel, or the ‘home textile industry,’ which produces items such as bedding or upholstery. The ‘textile industry’ can also include other textile uses, e.g., for medical, transport or construction industries. The fashion or garment and footwear portion of the industry is by far the largest.

**What do the terms ‘designing’ and ‘developing’ mean?**

In this report, ‘design’ refers to all design and development processes that conceptualize a product and prepare for it being placed into production. It is crucial that all of these functions are involved in the process of improving the sustainability of products, and not simply the product design teams. ‘Development’ or ‘product development’ are included in this scope, so the term ‘design’ is inclusive of the different stages of the design process. Where design and development choices are spread between departments or organizations, this is still considered the design phase.

## 2.3 What are the sustainability goals of the textile sector?

This section summarizes the impacts of the textile value chain and the associated global goals set out by its actors to reduce these impacts.<sup>36</sup> The level of knowledge around impacts and capacity to address them varies (e.g., the research and knowledge on biodiversity impacts is not as advanced), as reflected in their associated goals.

The significant impacts of the textile value chain are:

- Climate,
- Freshwater use,
- Chemical pollution (including chemicals of concern),
- Biodiversity loss, and
- Social issues, including labour rights, gender equality and a just transition

The distribution of these impacts across the value chain was mapped out in UNEP's Global Stocktaking report, which identified the hotspots in the global apparel value chain (see Box 3).

Many goals already exist to shift towards a sustainable and circular textile value chain. Below is a snapshot of some of the most relevant existing industry goals, from both specific initiatives and industry reports. It also includes some non-textile specific goals that are relevant to specific impact areas.

There are not yet any published quantified, sector-specific goals on supply chain transformation, consumer use-phase impacts or overall value chain impacts on water, chemicals, biodiversity, and social and labour issues. Goals on circularity and financial investment need more development and clarification, particularly as they are from specific reports rather than industry bodies currently implementing and monitoring them. There is also a need for additional fibre-specific industry goals for raw materials, although these are currently under development by key organizations. It is important that these goals are added or strengthened, and that where quantified goals are not at the industry level, at least the relevant

sector-level contribution or level of responsibility towards achieving that goal is understood. Further, many industry goals lack a target year or deadline, or do not provide a trajectory with interim targets that would allow for progress tracking.

For goals that are sector-specific and quantified, these are well recognized and broadly credible, within an industry that actively resists the duplication of goals and efforts. For this reason, this report will not aim to add to or duplicate existing industry goals, (which are summarised in Table 1 and Figure 5), but rather reference and use them to identify key actions that support the delivery of these goals for all actors in the value chain. UNEP is collaborating with Global Fashion Agenda (GFA) to consult experts and stakeholders globally to identify and converge existing industry aligned targets and formulate new targets where they are currently missing, to address gaps.<sup>37</sup>

### Box 3: What is a hotspot?

A hotspot is a stage in the life cycle of a product or service that accounts for a significant part of its environmental, social and/or economic impacts. A hotspot analysis approach allows focusing interventions on the areas that cause the highest negative impacts. Improvements in these high-impact areas (hotspots) will maximize the opportunities to reduce the impacts of the value chain as a whole.<sup>38</sup>

The figures displaying the impact distribution in the following chapters are extracted from UNEP's Global Stocktaking report. The impacts identified are applicable for apparel with 2016 as the baseline year (with apparel being the largest area of textile use, accounting for around 60 per cent of global fibre demand), although the environmental profiles of household textiles produced in similar value chains to apparel are expected to be similar. The environmental profiles of technical and industrial textiles are potentially very different. For more details – including on the methodology and data used – see UNEP (2020).

<sup>36</sup> The focus of this analysis is on industry goals and commitments that are global in nature. This report excludes specific certification schemes and standards or government initiatives since they often serve as a compliance mechanism, rather than an ambition-setting function.

<sup>37</sup> UNEP (2020). Sustainability and Circularity in the Textile Value Chain: Global Stocktaking.

<sup>38</sup> GFA (2022). Fashion Industry Target Consultation.

**Table 1:** Existing global industry goals

Impact area	Quantified general goal	Quantified industry goal	Non-quantified industry goal	Need for additional goals
Climate		The textile value chain reaches net zero emissions by 2050, in line with 1.5°C of global warming, and a 45 to 50 per cent reduction in supply chain emissions by 2030 <i>IPCC<sup>39</sup>, UNFCCC/Fashion Charter<sup>40</sup>, Textile Exchange<sup>41</sup>, Sustainable Apparel Coalition<sup>42</sup></i>		Use-phase impact goals
		The industry adopts 100 per cent renewable energy by 2050, and 50 per cent by 2030 <i>GFA/McKinsey report recommendation<sup>43</sup></i>		
Water	Companies implement water stewardship, set contextual and science-based targets for water <i>interpreting WWF,<sup>44</sup> SBTN<sup>45</sup></i>			Industry-specific and quantified goal
Chemicals			ZDHC Milestone: Chemicals of Concern according to ZDHC MRSL to be eliminated by implementing the ZDHC Roadmap to Zero Programme <i>ZDHC<sup>46</sup></i>	Quantified goal
Biodiversity	Companies implement science-based targets for nature <i>SBTN<sup>47</sup></i>			Industry-specific and quantified goal
Social labour and just transition			Ensure a just transition to environmental sustainability, that decent work principles are applied across the textile value chain, and companies support the delivery of SDG8 <i>ILO<sup>48</sup></i>	Quantified goal (if feasible)
			Publicly disclose Tier 1 facilities <i>Transparency Pledge<sup>49</sup></i>	

39 IPCC (2021). Climate Change 2021: The Physical Science Basis.

40 UNFCCC (2021). Fashion Industry Charter for Climate Action.

41 Textile Exchange (n.d.). About Us: Climate.

42 Sourcing Journal (2021). Sustainable Apparel Coalition Embarks on 'Bold' Second Decade of Action.

43 McKinsey and GFA (2020). Fashion on Climate.

44 WWF (n.d.). Water Stewardship.

45 Science Based Targets Network (n.d.). Freshwater.

46 ZDHC (n.d.). Roadmap to Zero.

47 Science Based Targets Network (n.d.). Biodiversity.

48 ILO (2015). Guidelines for a just transition towards environmentally sustainable economies and societies for all.

49 Transparency Pledge (n.d.). Our Demands.

Impact area	Quantified general goal	Quantified industry goal	Non-quantified industry goal	Need for additional goals
Circularity		Circular consumer offers make up 60 per cent of textile market revenue by 2050, and 30 per cent by 2030 <i>GFA/McKinsey report recommendation</i> <sup>50</sup>		Product design goal, consumption goals, end-of-life material capturing goals
		Textile utility is doubled by 2050 <i>interpreting EMF global vision</i> <sup>51</sup>		
Raw materials		Source 100 per cent of priority materials that are both preferred and low climate impact by 2030, ensuring that these do not negatively affect other SDGs <i>UNFCCC/Fashion Charter</i> <sup>52</sup>  25 per cent sustainably sourced by 2025 <i>The Fashion Pact</i> <sup>53</sup>		Additional fibre-specific goals
		45 per cent of polyester recycled by 2025, with a goal of 90 per cent recycled volume share by 2030 <i>Textile Exchange</i> <sup>54</sup> , <i>UNFCCC/Fashion Charter</i> <sup>55</sup>  Source 100 per cent sustainable cotton by 2025 <i>Textile Exchange</i> <sup>56</sup>		
Investment		\$30 billion is invested in the transition to circular and sustainable textile each year  <i>Fashion for Good report recommendation</i> <sup>57</sup>		Further development of goals in collaboration with (and adopted by) the financial industry

50 McKinsey and GFA (2020). Fashion on Climate.

51 EMF (2017). A New Textiles Economy. Redesigning fashion's future.

52 UNFCCC (2021). Fashion Industry Charter for Climate Action.

53 The Fashion Pact (n.d.). About The Fashion Pact. Redesigning fashion's future

54 Textile Exchange (n.d.). The 2025 Recycled Polyester Challenge

55 UNFCCC (2021). Fashion Industry Charter for Climate Action.

56 Textile Exchange (n.d.). 2025 Sustainable Cotton Challenge.

57 Fashion for Good (2020). Financing the Transformation.

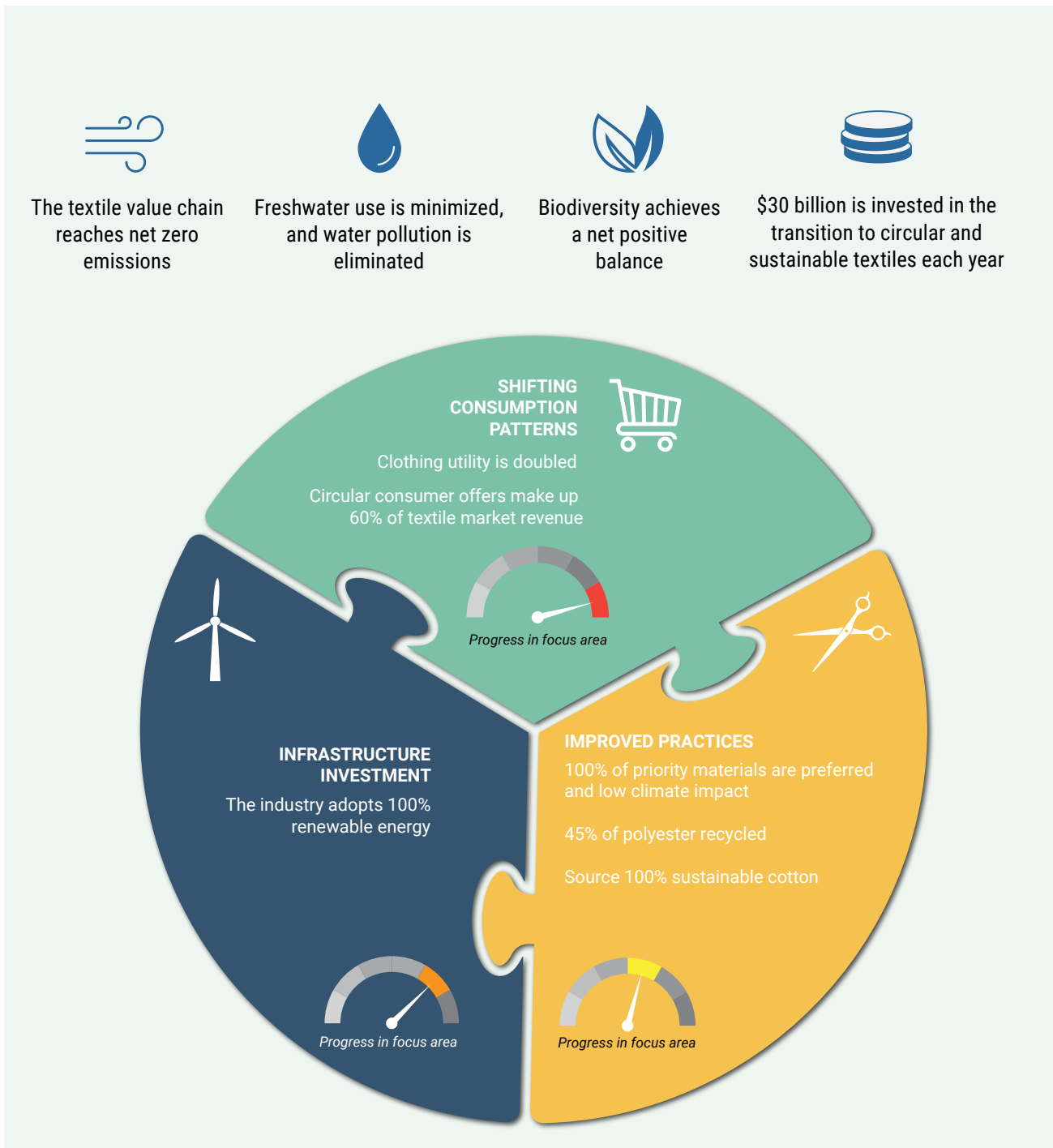


Figure 5: Existing quantified industry goals for a sustainable and circular textile value chain

### 2.3.1 Climate impacts

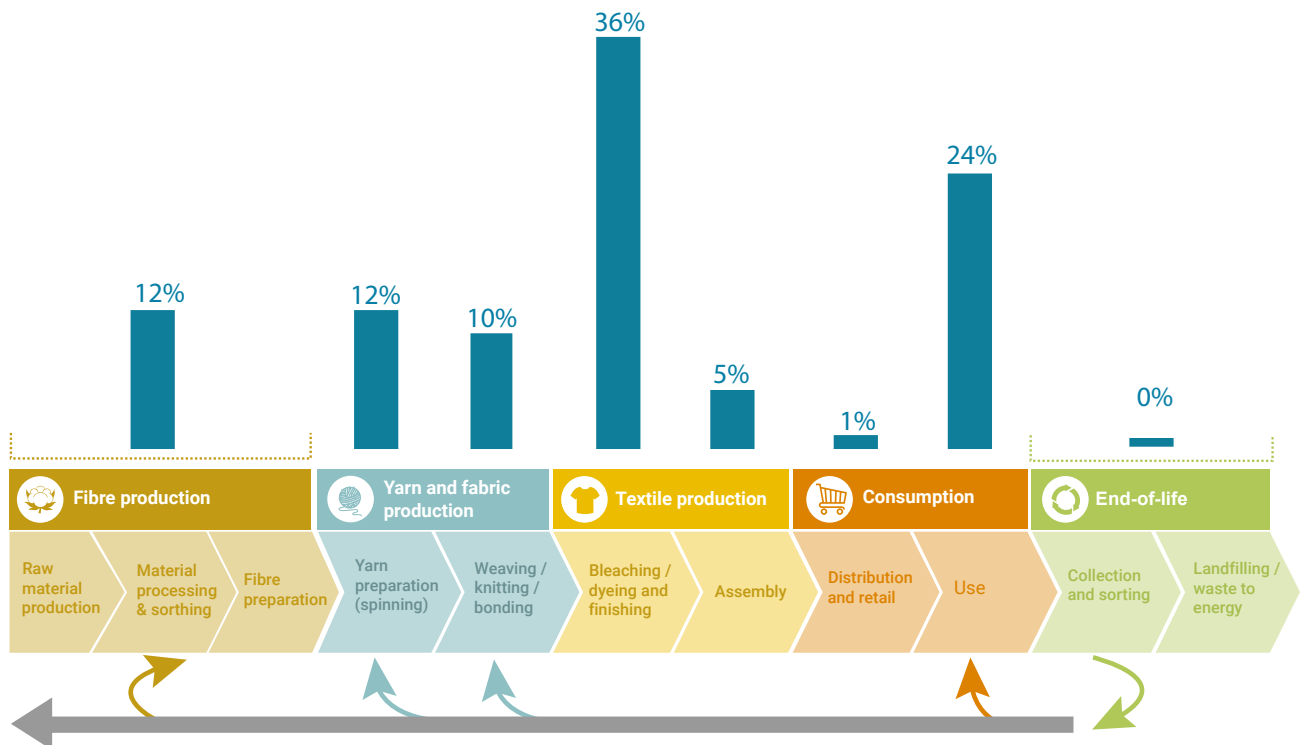
The textile value chain is estimated to account for 2-8 per cent of global GHG emissions, with sector CO<sub>2</sub> emissions projected to increase to nearly 2.7 billion tons per year by 2030, the equivalent of one year of emissions from nearly 230 million average passenger vehicles, assuming average driving patterns.<sup>58</sup> Figure 6 shows the distribution of climate impact across the global apparel value chain, with hotspots seen particularly during textile production and the use phase.

The Conference of the Parties (COP) process – hosted by the United Nations Framework Convention on Climate Change (UNFCCC) – resulted in a global agreement where all signatory countries adopt a roadmap on climate that will limit the world to a 1.5°C rise in average global temperature. This can be achieved if we reach net zero emissions by 2050, meaning that the amount of GHG removed from the atmosphere is at least equal to the amount emitted.

Recent work from McKinsey and GFA indicates that current textile value chain efforts are insufficiently ambitious and will only result in 50 per cent of the climate impact reduction required to achieve net zero emissions and meet the 1.5°C goal. They recommend that the fashion industry adopts 100 per cent renewable energy by 2050, and 50 per cent by 2030.<sup>59</sup>

Many textile initiatives have adopted the goal of net zero by 2050, such as the Fashion Industry Charter for Climate Action and the Fashion Pact. Other organizations have adopted medium-term targets in line with a 1.5°C pathway, as seen in Table 2. Together these cover the whole production phase of textiles, although no clear targets have been set on addressing use phase or consumption impacts, largely because there are major gaps in data to support the analysis required to establish robust impact baselines and identify suitable targets, as well as difficulties of measuring progress against targets.

Figure 6: Climate impact across the global apparel value chain



Source: UNEP (2020). Sustainability and Circularity in the Textile Value Chain: Global Stocktaking. (NB data is from previous UNEP report and is out of scope for this study. For details on methodology and limitations please refer to UNEP 2020.)

**Table 2:** Existing climate goals

Global goal/ commitment	Initiative	Details
Net zero by 2050	<a href="#">Fashion Industry Charter for Climate Action</a>	<ul style="list-style-type: none"> <li>All signatories set either 'Science Based Targets initiative'-aligned targets in line with 1.5°C or 50 per cent GHG reduction on all scopes by 2030</li> <li>100 per cent Scope 2 electricity from renewable sources by 2030</li> <li>100 per cent priority materials are preferred and low climate impact by 2030</li> <li>Phase-out of coal from owned and supplier sites by 2030, including no new coal power by January 2023 at the latest</li> </ul>
	<a href="#">Fashion Pact</a>	<ul style="list-style-type: none"> <li>25 per cent of key raw materials are lower climate impact by 2025</li> <li>100 per cent renewable energy across own operations</li> </ul>
	<a href="#">Race to Zero campaign</a>	<ul style="list-style-type: none"> <li>Minimum 50 per cent reduction of GHG emissions by 2030</li> </ul>
45 per cent reduction by 2030	<a href="#">Sustainable Apparel Coalition</a>	<ul style="list-style-type: none"> <li>Of their tier 1-3 membership, against 2019 baseline</li> </ul>
	<a href="#">Textile Exchange</a>	<ul style="list-style-type: none"> <li>Pre-spin impacts against 2019 baseline</li> </ul>

### 2.3.2 Freshwater use

The volume of fresh water consumed by the fashion industry today is estimated by one source to be nearly 79 billion cubic metres, anticipating that water use will increase by 50 per cent by 2030.<sup>60</sup> Engagement and public disclosure regarding brand targets and progress in relation to water remains limited: of the 136 textile companies invited to disclose through CDP's water security questionnaire, only 46 per cent responded, and of those respondents only 21 per cent (13 companies) identified water pollution as a substantive financial or strategic risk to their business. Figure 7 shows the distribution of freshwater use and water scarcity footprint across the global apparel value chain, with hotspots during fibre production, bleaching/dyeing and finishing, and the use phase.

Water impacts are felt locally rather than globally, so it is challenging to set a global goal that is also locally applicable. The **Science Based Targets Network** is currently working on methodologies that allow private companies to set locally relevant and science-based targets on fresh water, which are likely to be based on the water availability and needs of the region. The World Wildlife Fund (WWF) is working on an approach that will allow a step-by-step **approach** to science-based targets, while the CEO Water Mandate has a series of **action commitments** for companies to take.<sup>61</sup> Global volume targets are typically not set for

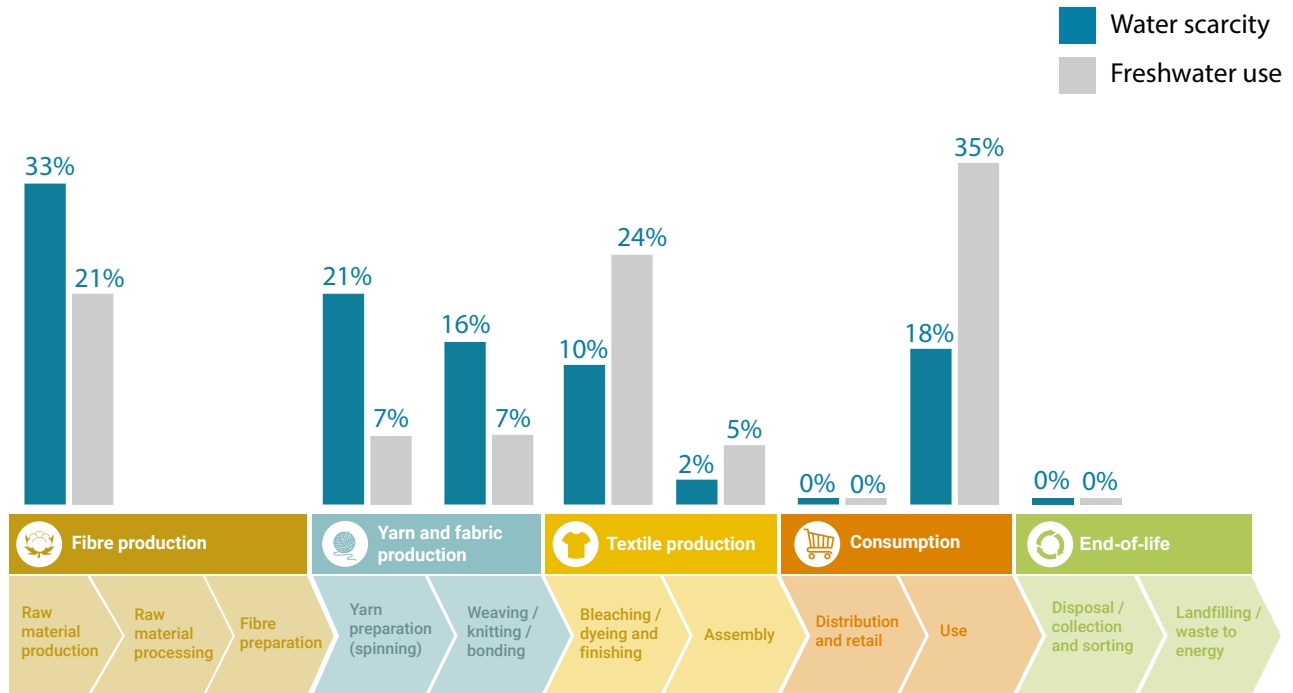
either individual companies or sectors, as water use targets depend on different local water issues, existing practices and regulatory effectiveness. Many existing initiatives recommend that companies take a water stewardship approach, which means that companies not only reduce their own impact but also work with other stakeholders including policymakers to address shared water risks and establish improved shared water management processes. Water quality targets are also typically not set, so stewardship programmes are important in addition to volumetric targets.

For the textile value chain, goals should therefore be focused on each key production and consumption region relevant to textiles with locally tailored delivery. Delivery of SDG 6 (Ensure availability and sustainable management of water and sanitation for all) is also a key shared water goal relevant to all value chain actors.

60 WWF (2021). Open Letter on Sustainable post-Covid recovery in textile sector.

61 CEO Water Mandate (n.d.). About Six Commitment Areas.



**Figure 7:** Freshwater use and water scarcity footprint across the global apparel value chain

Source: UNEP (2020). Sustainability and Circularity in the Textile Value Chain: Global Stocktaking.

(NB data is from previous UNEP report and is out of scope for this study. For details on methodology and limitations please refer to UNEP 2020.)

### 2.3.3 Chemical pollution and chemicals of concern

It is estimated that producing 1 kg of textiles requires 0.58 kg of chemicals,<sup>62</sup> many of which might be harmful to human health and the environment, damaging to natural ecosystems. 4 per cent of nitrogen fertilizers and phosphorous globally are used in cotton production<sup>63</sup> as well as an estimated 16 per cent of all insecticides and 7 per cent of all herbicides.<sup>64</sup> Wastewater discharge from wet processing sites can also be a significant source of hazardous chemicals and pollution in key production regions. Despite widely acknowledged concern over the volume and variety of chemicals used in the textile sector, it is still challenging to identify all industrial chemicals used and emitted due to limited capacity, a lack of transparency and poor tracking systems.<sup>65</sup> By eliminating human health impacts due to poor chemical management by 2030, an annual value of around €7 billion could be gained globally.<sup>66</sup>

As well as the clear links to SDG 6 above, the work of the textile sector on chemicals has significantly focused on eliminating chemicals of concern and implementing best practices around chemical controls, substitution and wastewater treatment practices. The ZDHC Roadmap to Zero Programme is one of the main initiatives focusing on chemicals, with the overall goal being to phase out the use of harmful chemicals in the textile value chain. While there is not a specific time-bound goal in place, the ZDHC Roadmap to **Zero Programme** has provided valuable frameworks for the industry, leading to cleaner and more sustainable chemical management within the fashion industry. The Strategic Approach to International Chemicals Management (SAICM) has also recognized chemicals in products as an emerging policy issue, with textiles identified as one of the relevant sectors.

62 EMF (2017). A New Textiles Economy: Redesigning Fashion's Future.

63 Heffer, P (2013). Assessment of Fertilizer Use by Crop at the Global Level.

64 Pesticide Action Network and the Environmental Justice Foundation (2007). The Deadly Chemicals in Cotton.

65 Secretariat of the Convention on Biological Diversity (2020). Assessing Progress towards Aichi Biodiversity Target 6 on Sustainable Marine Fisheries.

66 GFA (2017). Pulse of the Fashion Industry.

### 2.3.4 Biodiversity loss

Biodiversity loss is at dangerous levels, as evidenced by the lack of progress against global targets such as the Aichi targets and biodiversity-related SDGs.<sup>67</sup> Pressures from industry and farming on land use, freshwater resources and oceans can create losses of ecosystems, species and ecosystem services that support human life. The textile industry can have significant land-use impacts during raw material production, and much of the textile fibre production and textile processing can pollute and deplete freshwater resources and affect oceans through pollution, microfibres and shipping. The land-use impacts are illustrated in Figure 8.

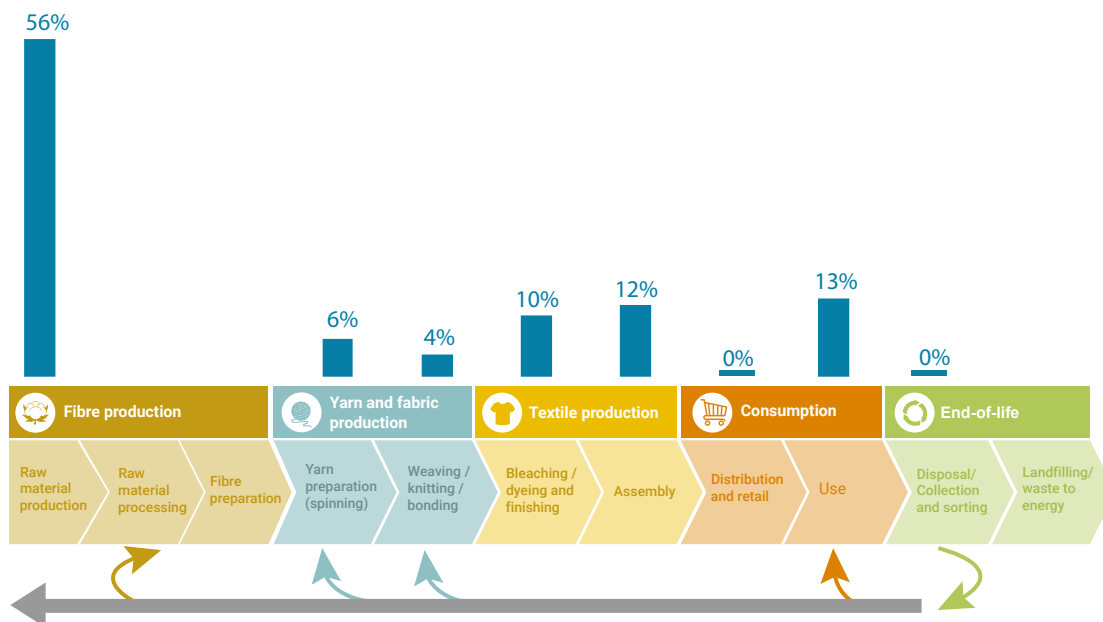
Across the textile value chain, actors need to take drastic action to reduce their impacts on biodiversity and support efforts to restore it, but unfortunately this is one of the areas where the data and resources are currently least available. Geographical ecosystem threats can be seen using data from tools such as the [UN Biodiversity Lab](#), although a systematic analysis of total impact and the actions required of companies remains under development:

Textile Exchange – in partnership with the Fashion Pact, Conservation International and the Biodiversity Consultancy – added a Biodiversity Benchmark module to the Textile Exchange Corporate Fibers and Materials Benchmark Survey, allowing brands to track how they understand and address biodiversity risk in their raw materials supply.

Science Based Targets for Nature has released interim guidance for companies on target setting for biodiversity and stated that “a nature-positive world requires no net loss of nature from 2020, a net positive state of nature by 2030, and full recovery of nature by 2050.”<sup>68</sup> This will require companies to analyse their impacts on nature and then set science-based targets for biodiversity.

The Fashion Pact has goals on biodiversity, including the development and implementation of strategies and Science Based Targets for Nature, developing individual biodiversity blueprints by 2020, and supporting zero deforestation and sustainable forest management by 2025.<sup>69</sup> The existing biodiversity goals are summarised in Table 3.

**Figure 8:** Land-use impact across the global apparel value chain



Source: UNEP (2020). Sustainability and Circularity in the Textile Value Chain: Global Stocktaking. (NB data is from previous UNEP report and is out of scope for this study. For details on the methodology and limitations, please refer to UNEP 2020.)

67 Secretariat of the Convention on Biological Diversity (2020). Assessing Progress towards Aichi Biodiversity Target 6 on Sustainable Marine Fisheries.

68 SBTN (2020). Initial Company Guidance.  
69 The Fashion Pact (2020). First Steps to Transform Our Industry.

**Table 3:** Existing biodiversity goals

Global goal/commitment	Initiative	Details
A nature-positive world requires no net loss of nature from 2020, a net-positive state of nature by 2030, and full recovery of nature by 2050	<a href="#">Science Based Targets for Nature</a>	<ul style="list-style-type: none"> <li>Companies should analyse their impacts on nature and then set science-based targets for biodiversity</li> </ul>
Development and implementation of strategies and Science Based Targets for Nature	<a href="#">The Fashion Pact</a>	<ul style="list-style-type: none"> <li>Develop individual biodiversity blueprints by 2020</li> <li>Support zero deforestation and sustainable forest management by 2025</li> </ul>

### 2.3.5 Social and labour issues and just transition

The textile industry needs to make significant progress in addressing social and labour issues within its value chain. There are significant social and health impact hotspots in both the fibre production and processing phases,<sup>70</sup> and potential for social and labour risks exists within new circular solutions; for example, for child labour in recycled material collection.<sup>71</sup> Research shows that a large proportion of textile workers in seven garment-exporting countries in Asia are paid below the minimum wage. Non-compliance rates in the sector range from 6.6 per cent of workers in Viet Nam to 53.3 per cent in the Philippines. In each of the countries, women are more likely than men to be paid below the minimum wage.<sup>72</sup> There are significant health issues for workers from exposure to hazardous processes, which in turn can have a significant impact on society and GDP levels.<sup>73</sup>

Addressing these issues is complicated by the significant proportion of textile workers employed in the informal sector, in business structures that have developed due to governance and structural issues. Indeed, many groups such as women, young people, migrants, older people, indigenous and tribal peoples, persons living with HIV or affected by HIV or AIDS, persons with disabilities, domestic workers and subsistence farmers may all be especially vulnerable to the most serious decent work deficits in the informal economy.<sup>74</sup> The priority social risks are outlined below in Figure 9.

The International Labour Organization (ILO) warns that as the textile sector “move[s] into new low-cost countries with limited capacity to implement laws and regulations, and with the pressure on profitability, working hours and wages that new technologies bring, there is a high risk that fundamental principles and rights at work will remain a distant aspiration for many employers and workers.”<sup>75</sup>

In the context of social and labour impact along the textile value chain, the ILO places particular importance on the need to address decent work, together with environmental impacts. Decent work is a concept involving “opportunities for work that is productive and delivers a fair income, security in the workplace and social protection for families, better prospects for personal development and social integration, freedom for people to express their concerns, organize and participate in the decisions that affect their lives and equality of opportunity and treatment for all women and men,”<sup>76</sup> and it includes the four pillars of employment creation, social protection, rights at work and social dialogue. In this context, the ratification and application of labour standards to the textile value chain is key in the realization of decent work.<sup>77</sup> Other metrics such as the alignment of stakeholders under the **Social and Labour Convergence Program** are about the uptake of aligned auditing standards and the reduction of supplier audit fatigue on social and labour issues.

70 UNEP (2020). Sustainability and Circularity in the Textile Value Chain - Global Stocktaking. Nairobi, Kenya.

71 Verite (2019). At Risk in the Recycling Sector Supply Chain.

72 ILO (2016). Weak minimum wage compliance in Asia's garment industry.

73 ILO (2021). Exposure to hazardous chemicals at work and resulting health impacts: A global review.

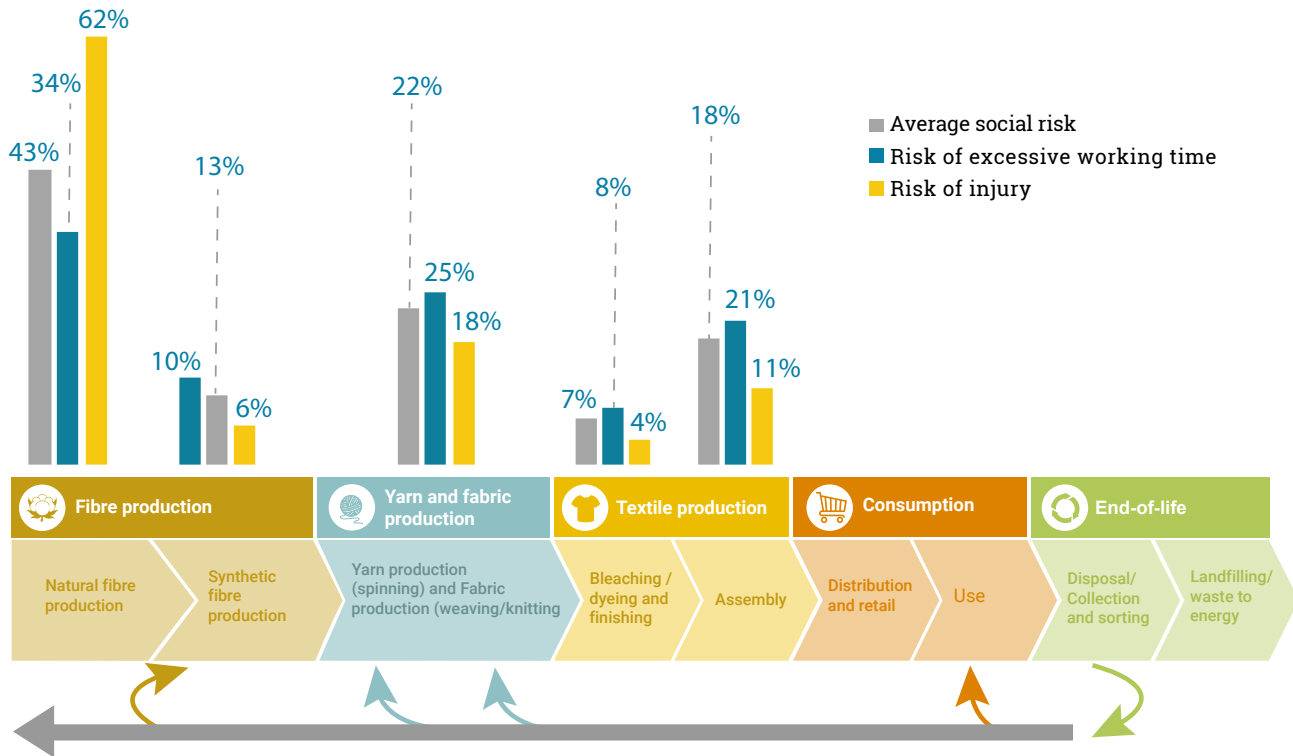
74 ILO (2015a). Transition from the Informal to the Formal Economy. Recommendation 204.

75 ILO (2015b). The future of work in textiles, clothing, leather and footwear. ILO Working Paper 326.

76 The concept of Decent Work has become a universal objective and has been included in major human rights declarations, UN Resolutions and outcome documents from major conferences including Article 23 of the Universal Declaration of Human Rights (1948), the World Summit for Social Development (1995), World Summit Outcome Document (2005), the high level segment of ECOSOC (2006), the Second United Nations Decade for the Eradication of Poverty (2008-2017), Conference on Sustainable Development (2011) and in the UN's 2030 Agenda for Sustainable Development (2015).

77 ILO (n.d.). Decent Work.

**Figure 9:** Social risks across the apparel value chain



Source: UNEP (2020). Sustainability and Circularity in the Textile Value Chain: Global Stocktaking. (NB data is from previous UNEP report and is out of scope for this study. For details on methodology and limitations, please refer to UNEP 2020.)

There are a number of guidelines that support countries and enterprises in identifying decent work impacts along the value chain. The OECD **Due Diligence Guidance for Responsible Supply Chains in the Garment & Footwear Sector** also provides a process for assessment, corrective action, and transparency on social (and environmental) issues in a company’s value chain, and can help companies to meet the due diligence expectations laid out in the OECD **Guidelines for Multinational Enterprises**.<sup>78</sup> Projects from Fair Wear Foundation and the ILO have demonstrated that investment in workers can pay major dividends in terms of business output, profits, cost savings and the delivery of environmental goals,<sup>79</sup> as well as the latest ILO **Code of Practice** on safety and health in textiles, clothing, leather and footwear.<sup>80</sup>

78 OECD (2021). Multinational Enterprises Guidelines.  
 79 ILO (2014). Promoting Rights at Work through Social Dialogue.  
 80 ILO (2014). Promoting Rights at Work through Social Dialogue.

**Box 4: Gender in the textile value chain**

Women represent an estimated of 80 per cent of the garment manufacturing workforce and 55 per cent of the workforce of the combined textile and garment sectors.<sup>81</sup> The apparel sector is one of the largest global employers of women workers, accounting for more than 5 per cent of working women in Asia and the Pacific, making it the largest employer of women among all industrial sectors. Emerging research suggests that the income that women receive from textiles employment can lead to improved outcomes such as better access to education, as well as increased decision-making powers within the community and in domestic matters such as marriage age and family size.<sup>82</sup>

However, there is also evidence of systemic inequality and struggle for women, including around pay equity, discrimination, violence and harassment, disproportionate unpaid care, work, and family responsibilities, and the lack of women's voice, representation and leadership across the industry.<sup>83</sup> Further, many homeworkers are women and children, and they are denied formal employment, sick pay, maternity pay, guaranteed employment, etc. This can also include challenges around piece-rate pay and/or failure to pay overtime, health and safety concerns such as fire safety, exposure to chemicals and inadequate infrastructure, highly controlled, stressful, and repetitive work environments, irregular work volume and schedules, and a lack of access to benefits such as health insurance and maternity leave.<sup>84</sup>

81 ILO (2022) The State of the Apparel and Footwear Industry: Employment, automation and their gender dimensions.

82 Heath, R. & Mushfiq, M (2015). Manufacturing growth and the lives of Bangladeshi women. *Journal of Development Economics*; and Sivasankaran,A., (2014). *Work and Women's Marriage, Fertility and Empowerment: Evidence from Textile Mill Employment in India*. Job Market Paper, Harvard University.

83 ILO (2018). *World Employment Social Outlook 2018: Greening with Jobs*.

84 Oxfam International (2004). *Trading Away Our Rights*; Fair Wear Foundation (2013). *Standing Firm Against Factory Floor Harassment*; BSR (2017). *Empowering Female Workers in the Apparel Industry*.

**Just transition**

The transition to circularity is expected to have a complex impact on employment in the textile value chain; for example, increased recycling may reduce demand for virgin fibres and related production jobs, while shifting to regenerative farming will likely create more employment. Some jobs may be lost in manufacturing, while new jobs will be created in repair, resale, sorting, pre-processing and recycling. Climate change mitigation could slightly reduce the share of women in total employment unless action is taken to reduce occupational segregation, as the employment gains associated with the 2°C scenario are likely to create jobs in currently male-dominated industries (renewables, manufacturing and construction).<sup>85</sup> Helping displaced workers and those facing other economic losses – through either direct compensation or skills development – will be crucial to ensuring that the transition towards circularity is just and inclusive. Consumers and access to clothing at suitable price points is another consideration to the just transition to ensure equitable access to textiles. Additional guidance can be found in the ILO's [guidelines](#) on ensuring a just transition.

The transition to circularity could create higher-quality jobs, especially for informal workers. The ILO estimates that implementing circular solutions – notably in waste management and recycling, and the services sectors, repair and renting models – could create a net growth of 6 million jobs globally by 2030.<sup>86</sup> However, achieving positive net outcomes requires targeted efforts from governments, companies and workers' organizations on issues such as wage protection, health and safety and rights, and the retraining and upskilling of workers for new types of work. Enforcement of existing and new legislation will also be critical, as will social consultation and inclusive discussions around environmental, social and economic policies. The transition to a circular economy may benefit some regions more than others. Countering this imbalance will require policymaker dialogue, as well as in-depth analyses of potential trade-offs, as well as completing impact assessments of potential large-scale interventions to specifically ensure those at risk or with skill gaps are considered during the transition to scaling circular business models.

85 ILO (2018). *World Employment Social Outlook 2018: Greening with Jobs*.

86 ILO (2018). *World Employment Social Outlook 2018: Greening with Jobs*.

A just transition is crucial in ensuring that the textile sector becomes resilient against shocks. The COVID-19 pandemic exposed disproportionate geographical vulnerabilities and impacts, particularly in the textile sector in Asia. Climate change coupled with unsustainable consumption patterns will continue to create supply chain shocks, and a just transition is therefore also needed to ensure that potential local impacts are instead turned into opportunities for accelerated community action to 'build back better.'<sup>87</sup>

### 2.3.6 Circularity

As outlined in section 2.1, circularity is best understood as an approach where materials are kept at their highest possible value as they move and are retained as long as possible within the textile value chain. This reduces and disconnects the use of natural resources and environmental impacts from the economic activity of the textile industry, while continuing to enable improvements in human well-being.

Circularity has strong potential to reduce the impacts from textiles production, although it also has significant potential to create ripple effects in global labour markets. GFA and McKinsey have estimated that circular business models could reduce GHG emissions by approximately 25 per cent,<sup>88</sup> and that for every 1 per cent increase in market share, circular business models can reduce emissions by 13 million

tons.<sup>89</sup> However, Business for Social Responsibility (BSR) economic modelling suggests that circularity, automation and other macro factors could significantly disrupt job growth across the fashion industry by 2030.<sup>90</sup> The variation between the number of jobs today and what we see in the scenarios is a range of 6.72 million jobs, reflecting over 11 per cent of the fashion value chain jobs included in the model,<sup>91</sup> making all efforts to a just transition as outlined in 2.3.5 key.

Four business models (resale, rental, repair, and remaking) – all of which have the potential to decouple revenue streams from production and resource use – currently represent a \$73 billion market.<sup>92</sup> Collectively, they have the potential to grow from 3.5 per cent of the global fashion market today to 23 per cent by 2030, representing a \$700 billion opportunity.<sup>93</sup>

No specific and measurable industry goals on circularity have actively been adopted for implementation by industry organizations. However, analysis from GFA and the Ellen MacArthur Foundation (EMF) indicates measurable 1 levels of ambition that would be suitable for setting and monitoring an industry target and are summarised in Table 4.

**Table 4:** Existing circularity goals

Global goal/commitment	Initiative	Details
Circular consumer offers make up 60 per cent of textile market revenue by 2050, and 30 per cent by 2030	<a href="#">GFA and McKinsey</a>	<ul style="list-style-type: none"> <li>This target is proposed within the GFA and McKinsey analysis of major climate impact reduction opportunities within the textile value chain. It is not yet adopted or monitored directly beyond the report, although GFA regularly update their information on industry sustainability progress.</li> </ul>
Textile utility is doubled by 2050	<a href="#">Ellen McArthur Foundation, a New Textiles Economy</a>	<ul style="list-style-type: none"> <li>This target is an interpretation from analysis by EMF. It is not confirmed as an industry target, and is not yet adopted or monitored.</li> </ul>

87 ILO (2018). World Employment Social Outlook 2018: Greening with Jobs.

88 McKinsey and GFA (2020). Fashion on Climate.

89 McKinsey and GFA (2020). Fashion on Climate.

90 BSR & Laudes Foundation (2021). Keeping Workers in the Loop.

91 BSR & Laudes Foundation (2021). Keeping Workers in the Loop.

92 EMF (2021a). Circular Business Models - Redefining Growth for a Thriving Fashion Industry.

93 EMF (2021a). Circular Business Models - Redefining Growth for a Thriving Fashion Industry.



### 2.3.7 Raw materials

The raw materials phase of textile production has significant impacts within the value chain, explaining why NGOs and brands working on sustainable and circular solutions have initially devoted strong attention in this area. For example, fibre production makes the third highest contribution to climate impact, largely due to the production of synthetic fibres,<sup>94</sup> and an improved material mix leveraging lower impact sources could deliver 41 million tons of GHG emissions savings.<sup>95</sup> Conventional cotton uses around 5 per cent of all herbicides and 16 per cent of all insecticides applied globally in agriculture,<sup>96</sup> and significant in-field impacts such as through nitrous oxide emissions are produced from fertilizer application.<sup>97</sup> There are significant risks of forced and child labour as well as other social and labour issues within raw materials production, but it is also an important source of livelihoods, particularly in developing countries, supporting the livelihoods of 250 million people worldwide, for example.<sup>98</sup>

It is also an area where many brands can have significant leverage, through requiring certified or verified more sustainable sources as part of the product specification, in contrast to processing impacts, which are much more challenging to enforce and incentivize with producers beyond tier 1. In many cases, brands specify that certified materials must be sourced (where these are available), and will therefore need to pay a premium directly to their supply chain partners or a central organization through a mass balance system. Regenerative agriculture is also a growing interest area for raw materials, where production practices aim to not only reduce impacts but also restore soil health and carbon and support ecosystems.

There has been significant activity around sustainable raw materials in recent years. Many brands have their own measurable targets around sourcing more sustainable raw materials, and certification schemes have goals around the scale of their uptake and sometimes impact reduction. The first industry-level targets around raw materials have begun to emerge in recent years, with the Fashion Industry Charter for Climate Action and the Fashion Pact setting goals around raw materials sourcing, and Textile Exchange beginning to set industry-level goals, sometimes in collaboration with other actors. These goals are summarised in Table 5. It is important to note that at least 55 per cent of textiles materials are from synthetic sources,<sup>99</sup> so it is not feasible to shift raw materials sourcing to fully land-based fibres due to land constraints and potential impacts and trade-offs. 'Closing the loop' to produce recycled fibres and improving practices within textile fibre types is a more effective way to reduce overall impact.

Recycled materials have been growing in popularity, but mainly driven by the use of polyethylene terephthalate (PET) from plastic bottles to create recycled polyester. There is some degree of closed loop, fibre-to-fibre recycling, but there are some significant barriers to full-scale closed loop systems, including challenges with the quality and scale of feedstock, separating blended fibres and scaling the infrastructure and technology needed. Even with these challenges, there is clear evidence that recycled fibres usually reduce impacts on many key metrics, including climate and energy, water and chemicals, as well as land use. It is not yet clear how recycled products perform when it comes to key challenges such as microfibre shedding, with further research currently under way.<sup>100</sup>

94 UNEP (2020). Global Stocktaking: Sustainability and Circularity in the Textile Value Chain.

95 McKinsey and GFA (2020). Fashion on Climate.

96 Pesticide Action Network and International Cotton Advisory Committee (n.d.). Pesticide concerns in cotton.

97 WWF (2017). Cutting Cotton Carbon Emissions.

98 Better Cotton (2015). Key Facts.

99 Textile Exchange (2021). Corporate Fiber & Materials Benchmark.

100 Microfibre Consortium (n.d.) The Microfibre Roadmap.



Figure 10: Improved impacts of recycling technologies

All recycled technologies are better across GHG, water and land usage



Source of origin	End product	GHG emissions material production, kg CO2/kg	Water depletion/ use, m³/kg	Land use¹, hectares/ton	Other sustainability aspects
Polyester	Virgin	●	●	●	Leakage of microplastics, incineration of virgin polyester fabric add 2.3 kg CO2/kg
	Biobased	●	●	●	Leakage of microplastics and does not prevent the production of polyester (as made from PET bottles)
	Monomer recycling - all else equal	●	●	●	Leakage of microplastics but prevents production of virgin polyester
	Monomer recycling - optimized²	●	●	●	Leakage of microplastics but prevents production of virgin polyester
Cotton	Virgin - conventional	●	●	●	Degrades soil quality exhausting fields and the use of fertilizers and pesticides threaten soil and water quality as well as health of biodiversity
	Virgin - organic	●	●	●	Reduces use of fertilizers and pesticides typically impacting biodiversity and soil quality.
	Recycled - all else equal	●	●	●	Recycling reduces quality - hence it cannot fully replace virgin cotton
	Recycled - optimized²	●	●	●	Recycling reduces quality - hence it cannot fully replace virgin cotton
Man-made cellulosic	Virgin	●	●	●	Modern pulp mills are able to produce additional excess heat and electricity to sell to the grid
	Recycled - All else equal	●	●	●	No excess heat and electricity sold to grid - limited benefits compared to virgin
	Recycled - optimized²	●	●	●	No excess heat and electricity sold to grid - limited benefits compared to virgin

EXHIBIT 5 Comparison of environmental impacts of virgin and recycled textiles

1 Ecological footprint, required to provide all the necessary resources and absorb associated CO2 waste to produce a given unit of textile  
 2 Optimized recycling technologies assume high degree of electrification, even in more energy intense process steps - hence possibility to reduce emissions to close to zero

Source: McKinsey and GFA (2021). Scaling Circularity. A Policy Perspective.

Table 5: Existing raw materials goals

Global goal/commitment	Initiative	Details
Source 100 per cent of priority materials that are both preferred and low climate impact by 2030, ensuring that these do not negatively affect other SDGs	<a href="#">Fashion Industry Charter for Climate Action</a>	The Fashion Charter requires all signatories to commit to deliver this target as part of its wider list of climate-related goals, and has a working group for each target aiming to scale industry-wide solutions.
25 per cent of our key raw materials are lower climate impact by 2025	<a href="#">Fashion Pact</a>	The Fashion Pact requires all signatories to commit to deliver this target as part of its wider list of climate-related goals, and carries out joint actions to support industry change against key targets.
45 per cent of polyester recycled by 2025, with a goal of 90 per cent recycled volume share by 2030	<a href="#">Textile Exchange</a> and <a href="#">Fashion Industry Charter for Climate Action</a>	This target is focused on volumes of recycled polyester sourced by brands, and was created jointly by Textile Exchange and the Fashion Charter. Textile Exchange will continue to create targets for uptake of more sustainable fibres by the industry.
Source 100 per cent sustainable cotton by 2025	<a href="#">Textile Exchange</a>	The 2025 Sustainable Cotton Challenge aims to shift the market towards the use of cotton grown using agricultural practices with improved environmental and social sustainability outcomes. It challenges brands to commit to sourcing 100 per cent of their cotton from more sustainable programmes and initiatives by 2025.

**2.3.8 Investment**

There are investment gaps in the technology, knowledge and experience needed to support a transition to a sustainable and circular textile sector. Investment will be needed at all stages of the value chain, from innovation research and development, incubating and scaling circular business models and circular products to ensuring that suppliers can access the necessary equipment, skills and technology to provide relevant products for a circular economy. SMEs already face additional challenges in obtaining financing to improve their environmental performance, therefore it is important that financial institutions ensure that SMEs in particular have access to investments needed for circularity.

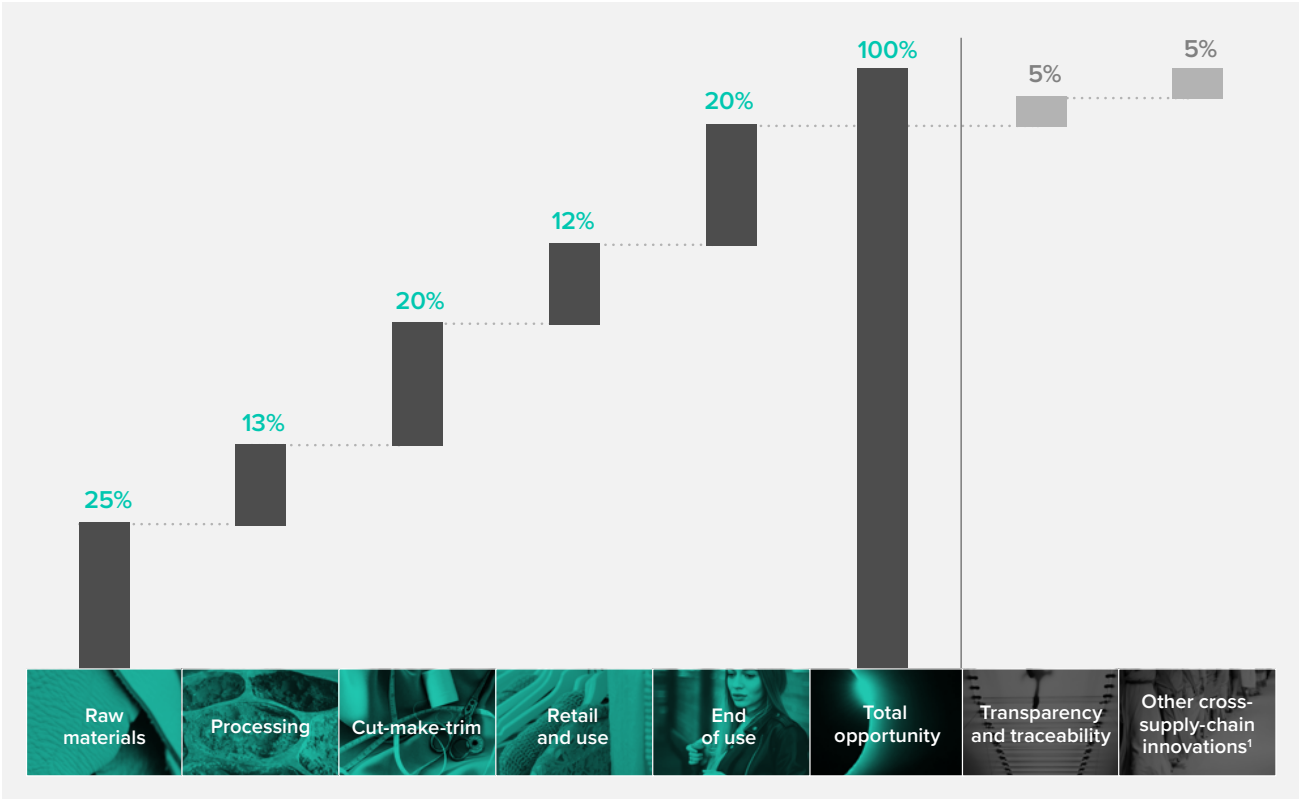
There has not been a significant degree of analysis on the levels of investment required to support a transition to a sustainable and circular textile sector. The main analysis has come from a report by Fashion for Good and Boston Consulting Group (BCG), exploring the degree of funding required to transform the industry, and where the funding is most needed (as summarised in Table 6 and Figure 11).

The report estimated that of the \$30 billion necessary investment each year, 25 per cent is needed to support raw materials innovations and improvements, 33 per cent for tier 1-3 transformation, and 20 per cent for end of use. Sixty per cent of the financing is needed for addressing issues around energy, water and waste alone.

**Table 6:** Existing financial goals

Global goal/commitment	Initiative	Details
\$30 billion is invested in the transition to circular and sustainable textile each year	<a href="#">Fashion for Good and BCG, Financing the Transformation</a>	While not being implemented by Fashion for Good and BCG as a monitored industry target, it is the only financial target set for the overall level of investment needed for the industry

**Figure 11:** Financing needs by value chain step



Source: Fashion for Good and BCG (2020). Financing the Transformation.







# 3

## What is needed to achieve a sustainable and circular textile value chain?

In order to prioritize effective action for all stakeholders and encourage collective engagement, this report applied a systemic value chain approach. Building on research and consultations with over 140 textile value chain stakeholders, it defines a common agenda of transformation towards sustainability and circularity.

To support a global value chain transition to sustainable and circular textiles, this report explores the actions that can be taken by specific types of stakeholders such as brands or policymakers. However, to reflect the interdependency of these stakeholders, there is also a strong focus on **building a clear shared agenda for action**. This results in three important interconnected priorities to deliver system change: **shifting consumption patterns, improved practices and infrastructure investment**.

These priorities are interconnected and will need to be addressed as part of a coordinated approach for all value chain actors. **Each one of the priorities (and the building blocks that underpin them) are dependent on each of the others for successful delivery**. For example, a focus on shifting consumption patterns – how products are designed, what kind of business models are offered to consumers and how aspirations are set – has the potential to radically reduce pressure on the production system and make it easier to improve practices in production sites, raw materials production and use-phase impacts. However, improved practices and infrastructure are also key to deliver successful circular business models, as they determine whether fibres can be captured and recycled, whether processes can be powered with safe chemistry and renewable energy, and whether the infrastructure and processes exist to deliver the sustainable and circular business model to the consumer.

Several initiatives have set ambitious goals to shift towards a sustainable and circular textile value chain (as outlined in section 2.3 and summarized in Figure 5), although progress to deliver them is often slow, due to the scale of the challenge, the opacity of the value chain, the lack of system-level policy, the technical and financial barriers, and the fragmentation of stakeholders beyond a small number of sustainability-minded multinational brands.

Figure 12: Three priorities to deliver system change in the textile value chain

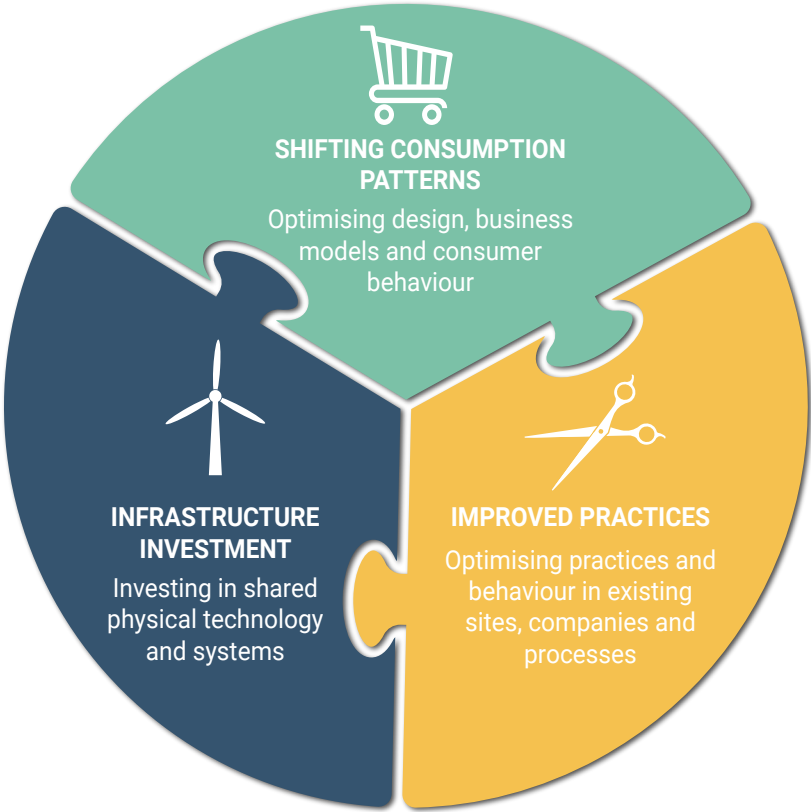
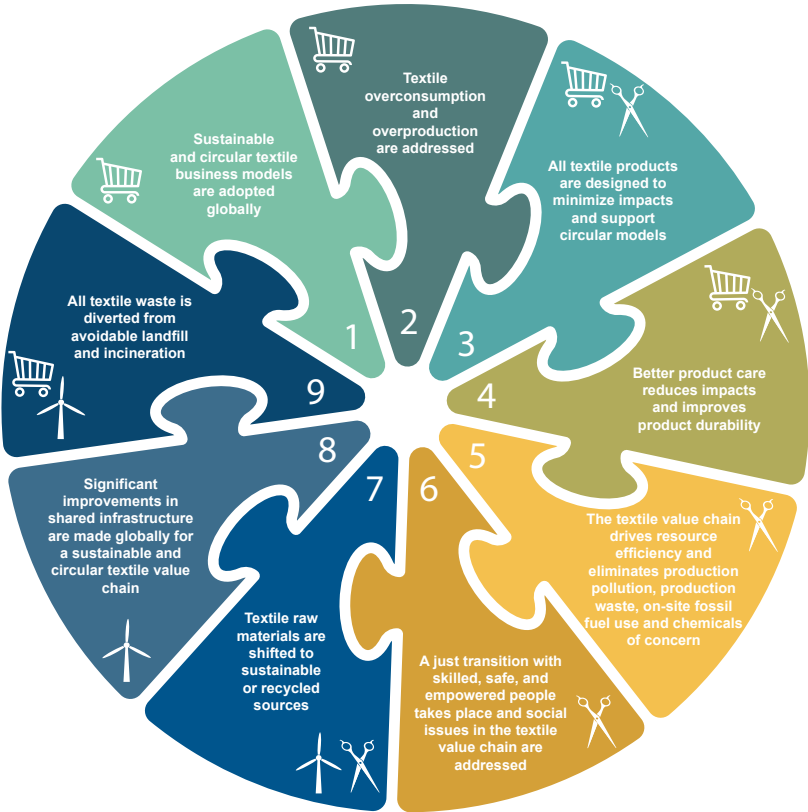











Figure 13: Nine building blocks needed to deliver the three priorities





To deliver on the three priorities and thus reach a sustainable and circular textile value chain, the roadmap proposes nine 'building blocks' that need to be delivered. 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.

Shifting Consumption Patterns	1 	<b>Sustainable and circular textile business models are adopted globally.</b> 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.
	2 	<b>Textile overconsumption and overproduction are addressed.</b> 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.
Shifting Consumption Patterns + Improved Practices	3 	<b>All textile products are designed to minimize impacts and support circular models.</b> 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.
	4 	<b>Better product care reduces impacts and improves product durability.</b> 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.
Improved Practices	5 	<b>The textile value chain drives resource efficiency and eliminates production pollution, production waste, on-site fossil fuel use and chemicals of concern.</b> Textile production sites – especially wet processing sites – require major support and investment to substitute machinery and apply circular production methods. This is particularly important for sites beyond tiers 1 and 2 of large multinational brands, or production countries without strong policy enforcement on cleaner production.
	6 	<b>A just transition with skilled, safe, and empowered people takes place and social issues in the textile value chain are addressed.</b> 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.
Improved Practices + Infrastructure Investment	7 	<b>Textile raw materials are shifted to sustainable or recycled sources.</b> 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.
Infrastructure investment	8 	<b>Significant improvements in shared infrastructure are made globally for a sustainable and circular textile value chain.</b> 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.
Infrastructure Investment + Shifting Consumption Patterns	9 	<b>All textile waste is diverted from avoidable landfill and incineration.</b> 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.

**Box 5:** How does this report define the different stakeholder groups?

**Brands and retailers:** For the purposes of this report, brands are established companies that do not have circular and sustainable approaches built into their business model. New innovative companies that are predicated on circularity and sustainability are covered under the group of 'innovators and recyclers.' Retailers include both in-store and online sales businesses that sell a range of products from different brands, with many also having their owned products sold in store.

**Communication and consumer engagement actors:** There are several different types of organization and outlets that engage with individual consumers, including brands, advertisers, print and digital media, social media and influencers and film and television. Brand, retailers and media outlets are some of the most influential groups in reaching and driving demand in consumer and citizens, but this work is relevant to innovators, policymakers, NGOs, and technical organizations that also strongly engage in outreach to consumers or citizens as individuals, and media outlets and advertisers are a conduit of this outreach. Therefore, all stakeholders communicating with consumers and citizens are relevant.

**Financial institutions:** Financial institutions can cover a multitude of actors, including institutional investors, philanthropic funders, impact investors, development banks and organizations, venture capital and investment banks, commercial lenders, insurers and trade financiers. All of these actors can unlock much-needed capital at each stage of the value chain and create innovative financial models or practices that can incentivize other actors.

**Innovators and recyclers:** Innovators across the textile value chain and recyclers 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. Due to this inherent positioning of business models and aims, these two types of value chain stakeholders are grouped together for the purpose of this report.

**Non-governmental, representative, and technical organizations:** This group includes NGOs working on both environmental and social issues, as well as universities/academics, data providers, technical consultants, researchers and think tanks. UN agencies and intergovernmental agencies can also provide technical support, such as on-ground technical assistance or creation of science-based knowledge. These are generally the actors that are well placed to apply a detailed technical lens to the challenges of the value chain, pursue non-profit or market transformation goals, peer review data collection or studies, and engage multiple actors to collaborate on solutions. They are enablers that challenge and support the ones that directly deliver on actions for a more sustainable and circular textile value chain, including playing an important role in supporting those that are weakest in the value chain.

**Policymakers:** Policymakers can be in a range of roles and institutions, from the global to local level. Local governments are often the most closely connected with the communities and businesses that operate within the textile value chain and can make or break efforts such as collective decision-making with communities on allocation of resources, protections, social schemes or verification of impacts. National governments are key to almost all policy interventions within the textile value chain. They can implement incentives, restrictions and enforcement, as well as set policy goals and plans. National government is not a monolith, and there are a range of different departments and roles at play. Elected officials may have different interests and timelines in mind than civil service departments.

**Producers and manufacturers:** Producers and manufacturers are those in tier 1-4 of the value chain (see Figure 4). They are the stakeholders that produce the raw materials, process the products and create finished goods.



## 3.1 Sustainable and circular textile business models are adopted globally

GFA and McKinsey have found that circular business models could enable the industry to cut around 143 million tons of GHG emissions in 2030. This is assuming that one in five garments are traded through circular business models, so a full transition to circular models could deliver much higher benefits<sup>101</sup>. They also found that each 1 per cent increase in market share of circular business models is likely to reduce emissions by 13 Mn tCO<sub>2</sub>e<sup>102</sup>.

For circular textile business models (such as rental, reuse or repair,<sup>103</sup> see also Figure 2) to be adopted globally, significant shifts will be needed in the perception of their benefits and feasibility, for consumers, brands and retailers. As the benefits of their value continue to be documented, and positive case studies are presented publicly (including financial benefits of their adoption), the focus must be placed on shifting the market away from linear models towards models that are sustainable and circular, i.e., that have demonstrated environmental and social impact reduction across the entire life cycle (in both the production and use phase). Alternatively, brand value can be entirely dematerialized to focus on selling experiences or digital content rather than textile materials and products.

### KEY ACTIONS

**Circular business models are normalized** and 'social proofed' through a change in narrative for the textile industry, across brand campaigns and advertising, as well as traditional and social media. Consumers are presented with compelling advantages of circular business models (beyond environmental benefits), such as convenience, variety, price or quality and shift their purchasing behaviour through positive aspiration.

**Companies invest revenue in circular business models**, so that the majority of their business value shifts away from linear business models towards more sustainable circular business models. They set business targets to signal this shift and begin to divest from linear models as they onboard new models, services and revenue streams. They reconsider how the company derives business value and look beyond physical products towards brand experience and digital value (such as selling digital fashion for online avatars).

**Value chains are adjusted and optimized** to support new business models with minimum impacts. Supply chain partners collaborate to adjust processes, with a goal of holistic improvements in impact and avoiding impact trade-offs (both environmental and social) in supply chain planning. For example, logistics systems are adjusted to support movement of products for multi-life uses or repair, production phases out use of chemicals of concern to support recycling, or solutions are found to track key data about products and materials.

101 McKinsey and GFA (2020). Fashion on Climate.

102 McKinsey and GFA (2020). Fashion on Climate.

103 EMF (2021). Fashion Business Models: Overview.

**Improved impact data and tools are made available** and allow companies and external stakeholders to evaluate the sustainability benefits of circular business models and product offers to ensure that they are substantially improving on conventional models. This also allows adjusting the approach to ensure optimal outcomes for alternative models and validate benefits to external audiences.

## THE ROLE OF DIFFERENT STAKEHOLDERS

**Communication and consumer engagement actors** can work to normalize circular business models and make the approaches aspirational. This includes shifting engagement resources away from promoting linear and unsustainable models and products, and towards more sustainable and circular options. They can highlight quantified and credible benefits compared to linear models and emphasize the behaviour aspects that are important to ensure effective outcomes of sustainable and circular models, e.g. not maintaining existing purchasing practices and adding sustainable and circular options in addition, but instead shifting completely away from linear and unsustainable models.

**Brands and retailers** can create new and attractive offers for the consumer through innovative circular and low-impact business models, and set and deliver targets on shifting their business revenue and investment from linear to circular and more sustainable business models. They can design products intentionally for circular models and emotional and physical longevity, and ensure that any circular business models, offers and designs are created with sufficient evidence to improve impacts and reduce consumption. They can not only use data to evaluate environmental and social impacts and improvements but also share their data and good practices to encourage the scaling and further refinement of circular models.

**Innovators and recyclers** can create new models of sharing, reuse and longevity, reflecting local identity and infrastructure context and focus R&D into new technologies to support circularity. They should aim to 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. They can 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., and 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. They can ensure that innovative models and products are demonstrably more sustainable than linear alternatives, and work with experts and credible tools to make sure that there is credible data to support claims.

**Policymakers** can create policies and incentives for sustainable and circular business models, such as tax breaks or seed funding for circular business models or subsidies or support for supporting aspects such as repair or refurbishment services. They can also explore reporting requirements for companies on the proportion of revenue or investment that companies are making in sustainable and circular business models. They can review guidance for enabling, encouraging and enforcing best practices in sustainable communication, establish frameworks for consumer product claims to address the challenges of greenwashing, and introduce influencer and sponsorship regulations aligned with sustainable lifestyles. They can help to fund the development of detailed data and tools to evaluate sustainability benefits from alternative models and ensure that there are no major trade-offs from alternative models and approaches.

**NGOs and technical organizations** can standardize and improve science-based methodologies and data for measuring impact and risk and make this data available to all, as well as clarifying and validating the use of claims such as being 'circular' and 'sustainable.' They can also build the business case and evidence base for circular business models, and share actionable analysis of potential trade-offs with circular systems, future emerging technological innovations and consumer insights. They can emphasize the importance of circular business models to consumers and raise awareness of good examples.

**Financial institutions** can proactively invest in sustainable and circular business models, including early-stage concepts, from both established brands and small start-ups. They can leverage expert data and evaluations to ensure that investment is made in demonstrably improved models and customer offers, and ensure that any trade-offs are identified and addressed.

**Box 6: Case studies – Circular business models****Brand examples**

While many brands are starting to incorporate sustainable and circular considerations into their business models, this is typically limited to sustainable material capsule collections, or leasing or resale businesses, which represent a very small portion of total company turnover. However, some companies are ensuring their core business strategy revolves around sustainable and circular textile business models.

MUD Jeans is a Netherlands-based denim brand, whose core product offered by consumers is leasing jeans. Products are produced with post-consumer recycled cotton, as well as certified virgin organic cotton, and consumers have access to free product repair for 12 months. When jeans are returned to MUD, they are either released to another consumer, or – if at the end of that product's life – are shredded to be input into the production of new denim products.

Animaná is an Argentinian social business founded in 2008 that prioritizes natural fibres from the Andes and Patagonia, using cultivation practices that promote the revival and protection of traditional culture and techniques. The brand was created by the founder of Hecho por Nosotros ("Made by Us"), an NGO that provides artisan textile communities in Latin America with capacity building programs to help them integrate circularity into their business models and practices, and access global markets. Over 8,000 artisans and 330 micro, small and medium-sized enterprises (MSMEs) have accessed training and resources to date, and in 2019 Animaná received the 'Best for the World' award by the social business certifier B Corp for their work in the 'changemakers' and 'communities' categories. Animaná's and Hecho por Nosotros' work on circularity has been recognized in their receiving special consultative status with the United Nations Economic and Social Council (UNECOSOC), where they raise awareness in high-level international forums on their experiences, challenges and ambitions on circular businesses.

**NGO and technical organization examples**

As part of the EU-funded Innovative Business Practices and Economic Models in the Textile Value Chain (InTex) project, UNEP uses its eco-innovation methodology and the EC's Product Environmental Footprint (PEF) methodology to train stakeholders – including policymakers, technical intermediaries and textile SMEs – on understanding how to apply circularity into their business models in the textile sector in Kenya, South Africa and Tunisia. Eco-innovation is the development and application of a business model, shaped by a new business strategy that incorporates sustainability and circularity throughout all business operations based on life cycle thinking and in cooperation with partners across the value chain. It was developed specifically for SMEs in developing countries. Applying those methodologies, the InTex project assists textile SMEs, including manufacturers, to shift to circular business models.

**Financial institution example**

The creative industry in East Africa often faces challenges in accessing finance. Heva is a finance, business support and knowledge facility that invests in creative businesses in East Africa. It has various funds, including their 'Young Women in Creative Industries Fund,' which provides loans and technical assistance to support women-owned and -led early-stage enterprises access investments in production, technology and capacity. Heva also conducted a project within Nairobi's Uhuru Market, an open-air market of over 1,000 MSME apparel producers and retailers. The project coupled financing with targeted health interventions (such as giving prescription glasses) and formal education on upskilling. In response to COVID-19-related needs, in 2020 Heva launched an e-commerce platform for the market to connect local traders with local customers.

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## 3.2 Textile overconsumption and overproduction are addressed

Mistra Future Fashion found that doubling the number of uses for a garment (from 30 to 60 total uses) reduced its functional GHG footprint by approximately 50 per cent.<sup>104</sup> The Ellen MacArthur Foundation has estimated that doubling the average use of a garment reduces GHG emissions by 44 per cent.<sup>105</sup> Both sets of analysis suppose the notion that longer wear of a particular item would fill a functional 'space' in someone's wardrobe, thereby reducing the overall consumption of that individual, although behaviour change is also required to ensure that this shift occurs. McKinsey and GFA also found that reducing overproduction by 10% would reduce emissions by around 158 million tonnes in 2030.<sup>106</sup>

**Circular business models must be accompanied by a significant decrease in overconsumption, particularly concerning clothing in developed countries. Overproduction is also currently a significant challenge, where production and stock systems are not accurately calibrated to demand and create waste streams of unsold stock.**

**Reduction of overconsumption can be achieved through a combination of increased textile utility and shifting norms and aspirations towards purchasing fewer items overall by focusing on the social and emotional sides of demand. It should be noted that many regions and demographics do not have high levels of consumption, meaning that goals around overconsumption would not apply but textile utility goals would still be relevant (e.g. producing higher-quality items that last longer). Overproduction can be reduced by optimizing demand and stock management processes, as well as exploring new models of sourcing such as on-demand production.**

### KEY ACTIONS

**Social expectations and narratives are adjusted** to reduce consumptive mindsets and shift behaviour and values towards fewer purchases in markets where there is overconsumption. Engagement with social media reduces the need for 'novelty' in products and slows the pace of trends or creates different responses to the need for newness (e.g. resale or rental approaches), while presenting alternative models of status and success and recalibrating what is deemed aspirational. Alternative options are provided for self-expression, such as customization or non-material goods.

**Emotional longevity is a clear focus**, with designs, product offers, surrounding narratives and additional functions ensuring that products are relevant to consumer needs for longer. This is achieved by creating timeless and consistently appealing products and offering modular, adaptable or customizable products. Emotional longevity also applies to multiple users (e.g. a design that resonates with the next purchaser and therefore creates an attractive resale market). When emotional longevity is in place, physical longevity has a much more positive impact. Conversely, without emotional longevity, items with high resource investment may be wasted on a product that is quickly sent to landfill. Within repositioned activities to focus on emotional longevity, it will be crucial that the approach of communicators (including brands, the media, influencers and beyond) is re-evaluated, and that they better understand their role in encouraging customers to continually seek out new products.

<sup>104</sup> Roos et al (2019). Environmental assessment of Swedish clothing consumption.

<sup>105</sup> EMF (2017). A new textiles economy: Redesigning fashion's future.

<sup>106</sup> McKinsey and GFA (2020). Fashion on Climate.

**Each product is made with long use in mind**, with long-lasting quality, except where products are deliberately made for shorter lifespans (e.g., personal protective equipment or performance products). Long-lasting quality is achieved by using durable materials, quality manufacturing techniques, fast dyes and high-quality trimmings, as well as designing to ensure that products can be repaired.

**Procurement options are optimized** to eliminate overproduction, including refined stock management and demand forecasting systems, testing of consumer response to products before production (e.g., through digital goods), stock management between retail locations, reconsidering returns processes, on-demand production models. Responsible solutions are applied to any remaining unsold stock such as resale, modification or responsible donations.

## THE ROLE OF DIFFERENT STAKEHOLDERS

**Communication and consumer engagement actors** can work to reframe the narrative using emotion-driven and aspirational messages and images linked to identity and culture to ensure that the consumer feels a gain rather than loss in reducing consumption. This includes considering emotional realities such as habits, decision fatigue and the primacy of other decision factors such as price, quality, and emotional dimensions such as style, trends and self-perception, as well as challenging whether 'consumption' is necessarily the only way to experience the social benefits and brand value of fashion and textiles. They can carry out nuanced analyses of real consumer motivations while understanding that diversity across groups makes consumer behaviour difficult to predict.

**Brands and retailers** can engage and inform consumers to shift them to alternative, non-consumptive ways to interact with the brand while still generating revenue, such as experiences or digital goods. They can ensure that products produced and sold have not only physical durability but also emotional durability and adaptability,

which keeps the customer excited about using the products for a long time and dissuades them from additional purchases. They can examine and eliminate consumer messaging that encourages overconsumption, and consider whether sustainability messaging is at odds with other messaging to consumers. Brands and retailers can also make important changes in their production and buying processes, exploring alternative sourcing models such as on-demand ordering, investing in improved stock management systems and predictive models that reduce overproduction and over-ordering, and commit to using responsible solutions to address any remaining unsold stock, such as collaboration with resale platforms, other forms of resale or reuse, or repurposing (retaining as much utility and value as possible).

**Policymakers** can create policies and incentives that help to shift consumption patterns and disincentivize overproduction, but should carefully consider potential social and economic impacts of reduced production and consumption within or beyond their own borders, exploring domestic or trade policy instruments (e.g. preferential tariff systems, sustainability standards, trade and investment facilitation measures, trade finance) or development funds that can be used to incentivize a just transition towards a sustainable and circular global value chain and allow production regions to adjust their approach to support alternative revenue streams from conventional production such as recycling or upcycling processes.

**NGOs and technical organizations** can engage consumers on shifting behaviour in a way that reduces impacts, and can guide brands, policymakers, and other decision makers on a sustainable pathway to reducing consumption and production that will not create major development and livelihood challenges. They can also support the gathering and monitoring of data on consumption patterns across different regions and demographics, consumer attitudes and successful engagement strategies that lead to behaviour change.

**Box 7: What is textile overconsumption?**

There is not yet a clear, agreed definition on overconsumption. It links intrinsically to the question of what is 'necessary' or 'unnecessary' textile consumption. More work is needed to fully define what level of consumption can be deemed 'unnecessary.' However, some clear dimensions will need to be considered, probably at the level of each individual as well as at a societal level:

**Functional necessity:** Functionally necessary consumption would involve each individual having sufficient textiles to a) keep them warm (or dry, or cool) for a range of typical activities in their relevant conditions, b) provide physical protection where needed, c) allow for hygienic use of the product (e.g. enough items to allow for cleaning and use concurrently) and d) allow for growth and other physical changes in people or spaces that require new items. For the average person, this probably indicates a functional minimum number of items of clothing, home textiles and other core functional textiles.

**Social necessity:** The social meaning of textiles can be much more extensive, and determining which ones are necessary or unnecessary is challenging. Some core necessary social functions might be to a) keep them covered based on the local requirement levels, and b) allow them to appropriately access key events such as job interviews or formal ceremonies. Element a) can reasonably be included in the functional necessity segment, while b) is also important to consider given that these social functions can be barred for those from lower income or marginalized backgrounds due to clothing limitations. Therefore, consumption levels will need to allow for sustainable and equitable access to these social goods, e.g. size, income and logistical access to relevant products, potentially through rental models or other circular models. Additional peripheral social dimensions of textiles (such as individual expression, group membership and social signalling) are not strictly necessary but may at a minimum level be important for fulfilling individual social needs (for example, as seen in Maslow's hierarchy of needs<sup>107</sup>).

**Planetary sustainability:**<sup>108</sup> Unnecessary consumption can also be tested by looking at how scalable the relevant levels of consumption would be. For example, if every person in the world were to have the same level of consumption – and considering the existing impacts of other parts of the economy – what impacts would this level of consumption have on planetary sustainability? This would be complex to fully calculate but can be a useful estimate to imagine what level of consumption might be appropriate.

**Based on these elements, it can be tentatively proposed that overconsumption can be defined as consumption that is a) beyond the physical and core social needs of an individual (as defined above), b) primarily driven by peripheral social needs (e.g., personal image and identify), and c) inconsistent with all other people on earth having the same level of consumption while ensuring planetary sustainability.**

More work is needed to refine these concepts; for example, to understand the degree of peripheral social need that is reasonably included to support individuals, and whether these needs can be provided without requiring additional consumption (e.g., through other methods of self-expression such as customization, adaptable items, digital or non-physical goods, etc).

As previously stated, the discussion on overconsumption needs to be contextualized. Consumption differs across income levels and countries, with one source<sup>109</sup> finding that the GHG emissions of fashion consumption of the richest 20 per cent of people across G20 countries are on average 20 times higher than the poorest 20 per cent. Living and consuming sustainably (broadly and within fashion specifically) must therefore differ by context. Rather, everyone needs to imagine a world in which some people consume less, while those who still need to meet basic needs consume in a way that is different from contemporary materialism.<sup>110</sup> The IPCC encourages the top 10% of income earners worldwide particularly to limit consumption and explore the good life consistent with sustainable consumption.<sup>111</sup>

107 Maslow, A.H (1943). A Theory of Human Motivation. Psychological Review, 50 (4), 430-437.

108 UNEP (2021a). For people and planet: the United Nations Environment Programme strategy for 2022–2025 to tackle climate change, loss of nature and pollution.

109 Hot or Cool Institute (2022). Unfit, Unfair, Unfashionable: Resizing Fashion for a Fair Consumption Space.

110 UNEP (2016). A framework for shaping sustainable lifestyles, determinants and strategies.

111 IPCC (2022). Climate Change 2022: Mitigation of Climate Change.

**Box 8:** Case studies – Consumption

**Brand example:** Black Friday has become a global shopping event, with companies from many sectors encouraging the purchase of goods with discounted prices. On Black Friday in 2011, Patagonia took a stand against this by taking out an ad in the New York Times with a photo of a jacket, and the headline 'Don't Buy This Jacket'. The brand encouraged consumers to commit to their Common Threads Initiative, focusing on only buying what is necessary ('reduce'), asking consumers to commit to repairing their products when damaged ('repair'), finding a new home for products and passing them on when no longer needed ('reuse'), keeping their products out of landfill and incineration by bringing back worn out Patagonia products ('recycle'), and finally together 'reimagining' a world where what is taken or extracted can be replaced by nature. Studies since the advert was published suggest that consumers have had a complex response to the messaging, with some exhibiting a reduced intention to buy the product while others with a positive response to the transparency and intention of the message may ultimately be more likely to buy from Patagonia. Many sources suggest that Patagonia's sales rose 30 per cent after the advert had been published, suggesting that anti-consumption messaging may need to take a sophisticated approach to avoid rebound effects.<sup>111</sup>

**Innovator example:** After the founder of Fixing Fashion participated in a two-year research project on the impact of second-hand clothing trade in Ghana, and finding that many clothing donations ended in landfill, Fixing Fashion was created to divert clothing from being donated and disposed of into landfill. Fixing Fashion is a free open-source platform that aims to teach anyone how to care for, fix and upgrade their clothes to extend their lifespan. Fixing Fashion has two aims: to teach people how to repair or upgrade clothing that they already have through the Fixing Fashion Academy platform, and share pictures of repaired items with the Fixing Fashion community to serve as inspiration for others.

The platform is designed using the same layout and appeal as e-commerce, but when users click on an item they see the repair that has been done, how they can carry out the repair themselves, and the equipment needed. A 'store' link on the platform is unclickable, with a red 'stop' sign showing when users try to click on it.

*Mention of an initiative, commercial company or product in this document does not imply endorsement by the United Nations Environment Programme or the authors*

<sup>111</sup> Karpova, E (2016). Don't buy this jacket: Patagonia's daring campaign.





### 3.3 All textile products are designed to minimize impacts and support circular models

According to a study from World Resources Institute (WRI) and the Apparel Impact Institute (Aii), designing and producing products to increase material efficiency by 10 per cent would drive 24 Mt CO<sub>2</sub>e of emissions benefits by 2030.<sup>112</sup> GFA and McKinsey estimate that reducing waste by 1-2 per cent in the transition from fibre to textiles, and in cutting waste in the manufacturing stage would contribute 24 Mt CO<sub>2</sub>e of emission reduction benefits.<sup>113</sup>

**Design must be informed and intentional to support sustainable and circular outcomes. 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. Better data and feedback loops will be critical to consider the knock-on effects of design at each stage of production, use phase and end of life. Mechanisms must be created to allow designers and product developers to consider the overall business model and impacts alongside commercial criteria. Minimizing impacts means that a product would aim to reduce environmental and social harms from production as much as possible, such as energy, water or chemical use, social and labour risks and issues, or other challenges such as material efficiency.**

#### KEY ACTIONS

**Products are designed for reduced impact**, considering: the full impact of design choices, including fabric choice, elements affecting reuse and recycling (such as design for disassembly), specific dyes, finishes, and structures; and designs optimizing efficiency such as minimizing fabric cut-out. Design choices that extend lifetime such as modular and repairable systems are also considered. Designers and product developers are trained and have access to design tools and impact analyses to support them in making optimum choices. They set ambitious targets around design-reduced production and use-phase impact reductions, as well as a goal on textile utility for each product.

**Products are designed for circularity**, including design for longevity, recycling, or disassembly (including modular designs, removable stitches/glue, or mono-material designs). Product design and business models are developed together to ensure optimal outcomes; for example, design for a leasing-based model would require high physical durability to last through frequent wears and cleaning. Design and business model impacts are evaluated holistically to ensure optimal outcomes.

**Design stays relevant**, and feedback loops are created from both producers and consumers to ensure that designs stay relevant and optimal. Producers gather data on impacts from design decisions and feed these back to designers and product developers, while consumer outreach gathers data on consumer behaviour, garment lifespan and design feedback to give designers and product developers insights into emotional and physical longevity.

<sup>112</sup> WRI and Aii (2021). Roadmap to Net-Zero: Delivering Science-Based Targets in the Apparel Sector.

<sup>113</sup> McKinsey and GFA (2020). Fashion on Climate.

**Design ensures that 'safe and recycled or renewable inputs' are used in products** with substances that are hazardous to human health, or the environment designed out of systems, as they affect safe material circulation. In line with the Ellen MacArthur Foundation Vision of a Circular Economy for Fashion, a prioritization should be made to source from recycled or renewable inputs, decoupling production from the consumption of finite resources.<sup>114</sup>

## THE ROLE OF DIFFERENT STAKEHOLDERS

**Brands and retailers** can engage with technical experts to engage and train design and product development teams for optimal outcomes, purchase decision and sourcing support tools, and support the funding of further data collection to allow for detailed analysis of impacts. Brands can design products to favour lower-impact material, design for low-impact production processes, design for durability and recycling, and base design decisions on clear evidence of environmental and social benefits across the life cycle and value chain. Retailers can implement product-level criteria to select products to stock.

**Innovators and recyclers** can explore inventive new design solutions to support reduced impact and increased benefits for consumers, and test innovations at small scale and in different regions to understand what will appeal to a range of people. They can spearhead design for circularity, and experiment with smaller closed loop systems in their own production.

**Producers and manufacturers** can collaborate with brands to provide feedback on the repercussions of design decisions for site-level processing impacts and provide alternative design and specification options with verified impact benefits. They can participate in efforts to gather and validate impact data to help inform design decisions in the future.

**Policymakers** can collaborate with technical experts to create incentives for more sustainable and circular product design decisions, taking account of the practicalities of effectively measuring and monitoring solutions and existing levels of relevant data by consulting with industry and experts. Where data, methodologies or tools are not available, policymakers can fund technical organizations to gather data to support decision-making and validate outcomes.

**NGOs and technical organizations** can work with brands, producers and other stakeholders to provide training, data and tools that will support sustainable and circular design and product development decisions, and where there are data gaps or a lack of suitable guidance, work to address these challenges through collaborative data gathering and validation projects. NGOs can also advocate for smaller or less powerful stakeholders needs in supporting impact reduction through design decisions (e.g. where producers find it impossible to reduce impacts due to design or specification decisions from customers).

**Box 9: Case studies - Design**

**NGO example:** The Ellen MacArthur Foundation is a charity that promotes the application of circular economy concepts to address major impacts of many industries, including climate change, biodiversity loss, waste and pollution. The Foundation aims to inspire and empower the world's designers and development teams, encouraging them to transform the current polluting system by embracing circular economy principles in everyday design and development decisions. Recognizing the huge potential of creatives, the Foundation published 'Circular Design for Fashion' in 2021 as a reference and source of inspiration for the fashion industry, focusing on what is achievable with significant industry shifts towards embracing circular design and circular textile systems. The book includes industry case studies from over 80 different brands, designers and companies, including Gucci, Gap, H&M, The Fabricant, thredUP and Vestiaire Collective.

**Technical organization example:** Design students and practitioners need access to training on circularity, including understanding key concepts and the impacts of design decisions. Courses – both online and in-person – are increasingly available. For example, UNEP's West Asia Sustainable Fashion Academy focuses on providing free courses on sustainable textiles and fashion, and eco-design for students and designers. In India, the National Institute of Fashion Technology – in partnership with UNEP – has a Management Development Programme on 'Sustainable Business Strategies for Fashion' aimed at mid- to senior-level managers and design professionals that is both free and online.

**Producers and manufacturers example:** Circular design has been present in traditional clothing for centuries and the practices, knowledge and materials used could serve as an inspiration for the modern textile sector. For example, to design out textile waste, excess fabric used in Japanese kimonos is folded and sewn rather than cut. In West Africa, wrapper cloths (also known as iro or pagne) are used for multiple purposes, including as a dress or wrap accessory, and often in prints that resonate with cultural identity. Indian saris are embellished to increase their value so that they can be handed down from generation to generation, and designed to be wrapped and temporarily pinned to fit different body shapes and sizes.

**Policymaker example:** The European Union's Strategy for Sustainable and Circular Textiles – released on 30 March 2022 – will require all textile products sold in the EU to be designed, produced, used and repurposed to be circular by 2030. It covers how to close the loop of the life cycle of textile products, but also the chemicals used in them, the recyclability of their fibres, the conditions in which they were produced, and how they are treated after initial use. The strategy will be translated into national policy, and will include requirements such as:

- Mandatory eco-design of products, including improvements in quality and durability, as well as fibre choice for recyclability and microfibre pollution prevention.
- Pollution reduction and prevention, including microplastic pollution measures for textile and whitegoods sector stakeholders, as well as textile waste measures such as Extended Producer.
- Responsibility requirements to make brands responsible for reuse and recycling, and measures to stop destruction of unsold or returned products.
- Transparency through the form of Digital Product Passport information on circularity and other environmental aspects, as well as verifying green claims.
- Favourable taxation measures for the reuse and repair sector.
- Promoting upskilling and reskilling needed for the transition.
- Infrastructure, funding and investment for circular business models to reshape consumer purchasing habits.
- Public-private partnerships for research, innovation and investments.

In addition to EU-focused policy, the strategy includes a focus on engaging with other partners at the global, regional and bilateral levels to ensure a shared vision of a circular textile sector.

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### 3.4 Better product care reduces impacts and improves product durability

GFA and McKinsey found that reduced washing and drying in the consumer use phase could deliver 186 million tons of reductions by 2030.<sup>115</sup> Additional data is needed on the use phase of textiles, as it is not well studied, and many textile brands exclude use-phase data from their calculations.

The use phase is challenging to address as consumers are diverse and global and there is a lack of data on impact and behaviour. Most textile brands do not include the consumer use phase in their impact evaluations and there are almost no large initiatives working on the phase. However, the chemical, energy and water implications of product care – alongside microfibre issues and product durability – are crucial parts of the impact of the textiles sector and must be addressed.

#### KEY ACTIONS

**Textile product care impacts are reduced** through technological innovation such as alternative cleaning methods, efficiency and increased microfibre filter capacity of white goods, or improved care products such as alternative detergents or improved product care service models.

**Clear recommendations, innovation and support are provided to consumers** to support better garment care for durability, alongside increased maintenance elements such as repair services.

**Behavioural norms are transformed** through changes in perception around product care, e.g. normalizing more infrequent cleaning, less use of dryers or the use of new technologies such as waterless cleaning. A range of solutions and messages are developed to reflect regional variation in current behaviour, values, infrastructure and appropriate solutions.

#### THE ROLE OF DIFFERENT STAKEHOLDERS

**Brands and retailers** can engage consumers on better product care behaviours and provide clearer low-impact product care guidance to them, while collaborating with other brands and retailers to ensure consistency across the industry. They can create mechanisms and incentives for product maintenance and repair for their customers, and shift customer perceptions of suitable product care behaviour. They can collaborate across the industry and support research into options and solutions to reduce use-phase impacts such as microfibre shedding. They can include use-phase impacts in their impact analysis and sustainability goals, so that consumer behaviour is within the scope of their sustainability activities.

115 McKinsey and GFA (2020). Fashion on Climate.



**NGOs and technical organizations** can provide analyses of potential or proposed more sustainable and circular garment care options, including a framework that brands and innovators can use to analyse potential actions and solutions. They can provide additional research on challenges such as microfibre release to support other organizations in taking appropriate action. They can facilitate collaboration between stakeholders within a range of connected industries (such as the white goods industry) to drive solution creation that addresses typical silos of thinking. They can provide consumers with clear and evidence-based information on better care approaches to reduce impacts and improve product durability.

**Innovators and recyclers** can create innovative product care solutions, such as new technology for cleaning, new and convenient product maintenance, or repair services, and new (low impact) fibres, finishes or processes that reduce the need for product care or repair. They can explore solutions that work in a variety of regions and contexts, and take account of local cultural needs and norms.

**Communication and consumer engagement actors** can engage consumers on alternative behaviours, solutions or technologies that will enable them to care for products more effectively and use them for longer. They can also address some social norms and stigmas around product care; for example, to address over-washing for items that do not need it.

**Policymakers** can support solutions that improve use-phase impacts and extend the useful life of a product; for example, working with industry experts, white goods companies, and wastewater treatment actors to address chemical and microfibre pollution from washing of textile products through better filtration systems, or supporting product repair services through tax incentives or subsidies.

**Financial institutions** can increase investment in innovative product cleaning solutions, and use a credible mechanism for understanding the potential benefits of new solutions. They can explore investor activism to encourage companies to include use-phase impacts in their impact assessments and impact reduction plans.

#### Box 10: Case studies – Product care

**NGO example:** Seeking to address the research and knowledge gap in relation to microfibre shedding, the Microfibre Consortium launched the Microfibre 2030 Commitment as a coalition of signatory brands, testing labs and other industry stakeholders. This Commitment aims to align the textiles sector surrounding the problem definition and scope of work, understanding microfibre ‘fragmentation’ and identifying steps to mitigate fragmentation. The Microfibre Consortium aims to launch a Microfibre Knowledge Hub in 2023 and the Microfibre Global Rating System in 2025 as industry resources to support in addressing this issue. The Commitment has targets on the scale of industry adoption of mitigation actions by industry stakeholders and is aiming to achieve zero impact from fibre fragmentation from textiles to the natural environment by 2030.

**Consumer engagement example:** With an estimated 336,000 tons of used clothing discarded each year in the UK, WRAP’s Love Your Clothes™ campaign – which was launched in 2014 – exists to reduce the impact of clothing on the environment. The campaign aims to change the way in which UK consumers buy, use and dispose of their clothing, with the end goal that purchasing circular products and using circular business models will be normalized and citizens will feel empowered to keep their clothing out of the bin. Through industry partners and direct brand engagement, Love Your Clothes provides a trusted voice to UK citizens, providing accurate knowledge and guidance for adopting positive sustainable clothing behaviours including longer product lifespan, lower temperature washing, etc. With digital campaigns reaching 25,000 organic views and 43,000 organic engagements, its ‘Habits for Life’ campaign aims to restore key life skills such as sewing, organizing community workshops and working with the local media and content creators to share campaign materials on social media.

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### 3.5 Production processes are optimized through resource efficiency and eliminating pollution, waste, on-site fossil fuel use and the use of chemicals of concern.

According to WRI and Aii, an energy efficiency improvement of 15 per cent per production unit in the processing phase of the value chain has potential benefits of 64 Mt CO<sub>2</sub>e between 2019 and 2030. Further, a 50 per cent shift away from on-site coal use for thermal energy in tier 1 and 2 (assuming a renewable alternative was available) would deliver a reduction of 105 Mt CO<sub>2</sub>e by 2030.<sup>116</sup>

Textile production sites, especially wet processing sites use significant amounts of chemicals, water and fossil fuels like coal for high temperature processes. They require major support and investment to substitute machinery and apply circular production methods, in particular the high number of sites that are SMEs in developing countries. This is particularly important for sites beyond the tier 1 and 2 of large multinational brands, or production countries without strong government intervention on resource efficient and cleaner production.

#### KEY ACTIONS

**On-site textile production processes are optimized** to eliminate air and water pollution and optimize water use, through technologies like closed loop systems (e.g. on-site water treatment and chemical recovery, systems that filter air emissions).

**Production by-product waste streams (such as fabric off-cuts, raw materials waste or waste from effluent treatment) are safely managed**, recycled and repurposed wherever feasible to their maximum value and function. Hazardous waste is managed carefully through qualified service providers and is put to alternative use where feasible. Systems are created to support factories in managing their non-hazardous waste streams to optimize the utility from waste products, such as the reuse or recycling of production waste.

**Resource efficiency measures are implemented** to reduce energy, waste and chemical waste, improve processes and optimize the whole production system. Energy efficiency can provide significant cost benefits for all producers in tiers 1-3, and can particularly benefit MSMEs.

**On-site fossil fuels are eliminated in favour of renewable energy**, such as replacing fossil sources for high-heat and backup generators for wet processing, producer and manufacturing sites. Viable alternatives are found – such as second-generation verified biofuel sources – or machinery is switched to allow for new technical solutions such as lower heat processes, blended energy processes or hydrogen.

116 WRI and Aii (2021). Roadmap to Net-Zero: Delivering Science-Based Targets in the Apparel Sector.

**Chemical inputs to production are limited**, and chemicals are routinely recycled within production systems as long as they do not pose a risk to workers and the environment. Chemicals of concern are not used, sustainable alternatives are found, and chemical inventories are available. Information on chemicals used in products is made available to protect workers and consumers, inform risk evaluations and ultimately to increase transparency for circularity, including information by chemicals suppliers.

## THE ROLE OF DIFFERENT STAKEHOLDERS

**Producers and manufacturers** can prioritize on-site improvements and innovation for environmental impact reduction in production, and engage with third-party experts to analyse the most effective and financially viable on-site changes and investments. They can identify feasible funding sources to support on-site improvements and ensure performance data is shared with relevant stakeholders and consider certification options. They can engage with value chain partners to trace impacts and risks and devise targeted actions to address them, and substantiate sustainability claims for raw materials and products. They can join collective efforts and programmes to improve industry practices and address system-level barriers to progress.

**Brands and retailers** can provide support and incentives to producers including third-party technical and financial capacity and programmes and relevant commercial terms, as well as exploring effective commercial incentives for supply chain partners. They can proactively fund or establish industry collaboration programmes that increase the uptake of sustainable practices for producers globally. They can set their own goals around reduction of supply chain impact and work to implement the required solutions with producers - directly or indirectly monitoring impact reduction progress using agreed industry metrics and data-collection methods.

**Policymakers** can identify gaps and opportunities in policy for improved practices in collaboration with expert advisers and stakeholder input, and implement further regulation, including wastewater treatment and water use limits, limits for site-level GHG and air pollution emissions, limits and process requirements on hazardous and conventional waste, and limits or bans on chemicals of concern. They can optimize positive and negative incentives for producers; for

example, phasing out fossil fuel subsidies, providing finance for on-site improvements, or providing tax incentives on improved technologies. They can ensure the effective implementation of policy, (e.g. increasing penalties for violations, increasing resources for monitoring and enforcement, stronger oversight to avoid corruption) and that policy changes are predictable and long term.

**Financial institutions** can identify root causes of credit and funding barriers and create solutions for Global South regions, (M)SMEs, early-stage innovation, solutions in under-funded investment areas, female or ethnic minority-led enterprises, and other key groups that struggle to access funding. They can create new approaches to funding, including blended finance, system-level aggregation of financial needs, digital solutions, alternative mechanisms for demonstrating creditworthiness, smaller scale funding appropriate for developing country contexts, and early seed funding.

**NGOs and technical organizations** can encourage companies to set ambitious targets and monitor and report their progress through credible mechanisms, and support policymakers to implement ambitious policy and address challenges. They can set a clear timeline for industry-level change and monitor progress against it. They can provide technical assistance and capacity-building to those that most need it, e.g. SMEs in developing countries, and create programmes to support the transformation in key regions.

**Box 11: Case studies – Production processes**

**Tier 1 example:** The Hirdaramani Group is a tier-1 CMT business, headquartered in Sri Lanka. It has set 2025 targets in line with UN Sustainable Development Goals, seeking to achieve 'conservation goals' in 50 per cent absolute GHG savings, 80 per cent of all raw materials used to be 'certified sustainable', 50 per cent reduction in industrial freshwater consumption, and 0 per cent waste to landfill. Further, the Hirdaramani Group has achieved net zero for GHG emissions from energy across its manufacturing in Sri Lanka and has launched rooftop solar projects in Sri Lanka and Viet Nam. Increasingly, manufacturers are developing such commitments and taking action to publicly share their progress to date via sustainability reporting and website communications.

**Tier 2 example:** Yee Chain International Co., Ltd was founded in Taiwan, Province of China, in 1997 and is a tier-2 performance fabric manufacturer for mostly sports footwear brands. They focus on developing new and circular textiles in collaboration with clients (who Yee Chain refers to as 'brand partners'). After identifying and analysing their environmental hotspots (including material waste streams, water, energy and chemical use), Yee Chain collaborates with clients to share information on their hotspots and co-create solutions to them. Yee Chain identified the issue of fabric waste caused by inefficient product development and purchasing practices as a priority. Fabric waste is considered an 'invisible' waste, as it is not detected or measured in most audits. Together with clients, they identified solutions including collaboration on material choice, product design and better internal brand alignment on solutions that were not measured by existing brand sustainability KPIs. Using this approach, they achieved their initial goal of reducing 'invisible' textile waste by 5 per cent (over 6,000 kg), and now work internally to reuse excess textiles for different orders. They are also incorporating client collaboration on hotspots systematically into their operations, including piloting solutions and developing principles to guide clients on how to best enable supplier partners to implement changes to avoid generating waste from the product development phase.

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### 3.6 A just transition with skilled, safe and empowered people takes place and social issues in the textile value chain are addressed

ILO estimates that transitioning towards a circular economy across sectors could create a net total of 6 million new jobs by 2030, compared to a business-as-usual scenario.<sup>117</sup>

The successful implementation of circular and sustainable solutions requires skilled, safe and empowered people. The social impacts of the textile sector have long been the subject of attention from brands, media, consumers, and NGOs. Further work is needed to address the social impacts of the linear system while also ensuring those are not replicated in a circular value chain. Delivering effective plans for a sustainable and circular textile value chain requires including and collaborating with previously marginalized communities (such as women, young people, migrants, older people, indigenous and tribal peoples, persons affected by HIV or AIDS, persons with disabilities, domestic workers and subsistence farmers), and less-developed countries to avoid significant trade-offs and negative consequences.

#### KEY ACTIONS

**Marginalized communities are included in planning for the transformation** of the textile industry to ensure that approaches take account of the needs of neglected consumer bases, affected production region communities or groups with links to key issues. Consultation is built into all planning on sustainable and circular textiles, particularly with stakeholders with more influence such as policymakers, brands, trade unions, employers' organizations and financial institutions. This will typically also include many informal workers, of which there are many in the textile industry.

**Any negative social trade-offs of circular and sustainable approaches are addressed** through identifying and recognizing potential inequities and losses from specific interventions, compensations such as alternative job creation and training for displaced workers, and creating a mechanism for interregional compensation, and supports for unavoidable trade-offs. Value chain stakeholders conduct suitable due diligence to prevent, mitigate and account for potential negative trade-offs from transition.

**Decent work issues are addressed**, such as child labour, living wages, migrant labour, forced labour, working hours, social protection and safety. Strategies to ensure the transition to formalization of new business models is put in place and an enabling environment for sustainable enterprises is developed. Existing international labour standards are applied throughout the textile value chain, and all workers' rights are protected through concerned action by governments, employers' organizations, and trade unions. The rights of those in the value chain (including new value chain actors such as collectors of recycled materials, repair, and resale businesses) are promoted and applied through due diligence mechanisms.

117 ILO (2018). World Employment Social Outlook 2018: Greening with Jobs.



**Equity is integrated as a key principle to guide the transition** by – for example – considering outcomes for workers in sustainable and circular model design and evaluation, as well as having a focus on creating decent jobs and fair systems.

### THE ROLE OF DIFFERENT STAKEHOLDERS

**Producers and manufacturers** can work with external experts and their customers to implement best-in-class social and labour standards on-site and pay workers a living wage. They can implement health and safety protections, training, rights, and protections for vulnerable workers, and encourage active worker engagement and consultation on key decisions and planning.

**Brands and retailers** can provide support and incentives to producers to implement best practice social standards on-site, and engage policymakers and expert organizations in relevant regions to support a system-wide transition to better practices, including a clear understanding of living wage requirements, strengthening legal protections for workers, and gathering relevant data to support the analysis of challenges and progress. They can ensure that social and equity issues are considered during all strategic company decisions, and that a wide range of appropriate stakeholders are consulted on business and sustainability strategies. They can ensure that they carry out a due diligence or risk assessment process at least annually to ensure that social risks are analysed and understood. Where possible, brands measure the impact of their business models on workers to inform their current and future interventions.

**Communication and consumer engagement actors** can raise awareness of social and labour issues within the textile sector, its intersectionality and its role in climate justice, highlighting the lives of factory workers, farmers and affected communities as well as emphasizing the important role of inclusivity and diversity in narratives around the textile and fashion industries.

**Policymakers** can identify gaps and opportunities for implementing improved social and labour practices and protections within their regions, and increase standards on wages and working hours, as well as social and labour protections. They can optimize incentives for improvements as well as ensuring the implementation of policy is effective (e.g. increasing penalties for violations, increasing resources for monitoring and enforcement, stronger oversight to avoid corruption) and that policy changes are predictable and long term. They can ensure that marginalized groups and communities are actively consulted on policy decisions and strategies, and that sustainability solutions are designed in collaboration with those who are likely to be affected by them.

**NGOs and technical organizations** can encourage companies all along the value chain to set ambitious social and labour standards and targets, and monitor and report their progress through credible mechanisms. They can engage policymakers to implement ambitious social policy and address challenges in social inclusion and protections. They can provide technical assistance and capacity-building on improved social practices.

**Innovators and recyclers** can ensure that social risks and impacts are carefully considered when systems or solutions are created (including the significant risks of social and labour issues within the waste collection workstream). They can also carefully consider whether solutions are appropriate for their target audiences and as inclusive as possible to different groups (e.g. that lower-income actors are not systematically barred from innovative sustainability solutions), and whether their solutions could potentially create social negatives for communities worldwide. They may need to work with a technical third party to identify these challenges, or systematically work through a due diligence approach.

**Box 12: Case studies – Just transition and social/labour improvements**

**NGO example:** Plastics for Change estimates that there are more than 10 million informal waste collectors worldwide who are marginalized, live in poverty and do not have formalized, regular employment. Many of these waste collectors collect plastic waste, which can be an input for the textile industry's demand for recycled polyester yarn and fabric. Plastics for Change is seeking to empower these informal waste collectors and create a market platform for brands to source FairTrade verified recycled plastic. Waste collectors benefit from a fair and consistent price, improved sanitary working conditions and more stable income for their families. Plastics for Change is committed to a just transition to a circular economy, and is supporting those at most risk to participate in and benefit from this transition.

**UN agency example:** Under the Decent Work in Garment Supply Chains Asia project, the ILO has released a "Just Transition Toolkit." The toolkit looks at how to drive behaviours and practices throughout the textile and garment supply chain in Asia, and provides specific advice on just transition in the garment sector to social partners and industry stakeholder groups including governments and policy actors, enterprises and workers. The toolkit comprises reports, briefs, highlights, videos and infographics on best practice environmental regulation and policy settings, eco-innovation processes and barriers to uptake, multi-stakeholder initiatives, and just transition in the sector.

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## 3.7 Textile raw materials are shifted to sustainable or recycled sources

WRI and Aii have estimated that material substitution could deliver 39 million tons of CO<sub>2</sub>e reduction by 2030,<sup>118</sup> while GFA and McKinsey have estimated that decarbonized material production could reduce annual GHG emissions by 205 million tons.<sup>119</sup>

**While the aim is to reduce the volume of raw materials needed through reduced consumption, circular business models and improved design and production efficiency, there will remain a need for raw materials (both recycled and more sustainable virgin materials). Since this part of the value chain has a significant degree of impact, textile raw materials need to urgently shift towards sustainable and recycled sources. Rapidly scaling new production and cultivation practices is a priority, as well as supporting the development of fibre-to-fibre recycling capacity alongside the infrastructure in section 3.8. It is crucial that all input raw materials are converted to more sustainable sources regardless of whether they are naturally derived, regenerated, or synthetic materials. Actions focusing on one material only, such as an overarching phase-out of synthetic fibres, could cause unintended negative consequences for workers, land use, biodiversity, etc. Industry tools are available to help stakeholders navigate materials options and the nuance of alternatives available.**

### KEY ACTIONS

**Cultivation of textile raw materials is sustainable,** with production addressing and eliminating pressure on water, biodiversity, hazardous chemicals and energy through certification, improved cultivation practices or alternative systems such as regenerative farming. This is achieved by scaling existing and new low-impact production practices, creating incentives for farmers and producers, and providing technical and policy support for education and investment in improved on-site technologies (such as solar irrigation, laser levelling or mechanization).

**Where possible, fibre-to-fibre recycling is scaled** in an efficient and safe way, using textiles fibre to close the loop on production. Significant challenges such as fibre blends and information tracking are addressed through whole value chain solutions, such as design for recycling and phasing out of hazardous chemicals. Sites in the textile value chain install new equipment and capacity that allow them to take part in fibre-to-fibre recycling solutions.

### THE ROLE OF DIFFERENT STAKEHOLDERS

**Producers** can consider taking on a voluntary certification scheme that validates and rewards best practices. They can engage with governmental or NGO/technical organizations to understand and implement available better practices for farming, forestry, or extractives, or join collective efforts and programmes to improve industry practices and address system-level barriers to prioritize on-site improvements and innovation for environmental impact reduction in production. They can engage with value chain partners to trace impacts and risks and devise targeted actions to address them, and substantiate sustainability claims for raw materials and products. They can identify feasible funding sources to support on-site improvements, potentially through industry-level collaboration or through government finance. They can also ensure that performance data is shared

118 WRI and Aii (2021). Roadmap to Net-Zero: Delivering Science-Based Targets in the Apparel Sector.

119 McKinsey and GFA (2020). Fashion on Climate.

with relevant stakeholders.

**Brands and retailers** can carry out a risk analysis of raw material impacts and create a sourcing strategy that prioritizes key environmental and social actions based on the degree of harm along the life cycle. They can monitor impacts and impact reduction progress using agreed industry metrics and data-collection methods. They can shift their sourcing strategy by specifying lower-impact raw materials including credibly certified voluntary schemes and close-loop recycled products. They can financially support the establishment of effective certification and best practice implementation programmes, and work with policymakers and technical organizations globally and in key regions to make sure that farming, forestry and extractives industries are moving towards sustainable production. They can invest in programmes and schemes that support the creation of recycled textiles fibres, particularly for fibre-to-fibre recycling options.

**Policymakers** can ensure that legal structures effectively regulate production impacts and incentivize improved practices, particularly considering water allocation permits, use limits or bans on chemicals of concern, incentives for on-site renewables, incentives for biodiversity protections, social and labour best practices and overall best practice requirements for farming, forestry or extractives industries. Policymakers can ensure that practices are effectively monitored and enforced, and that there are no unintended negative consequences from other policy areas (e.g. incentives for the use of fossil fuels). They can also invest in capacity-building resources for farmers, foresters and the extractives industry to ensure that information on optimized

practices is mainstreamed, and implement incentives for fibre-to-fibre recycling.

**Innovators and recyclers** can ensure innovation around raw materials continues, particularly where evidence is provided on impact reduction benefits. They can create solutions in particular to support closed loop recycling of textile fibres, in terms of both recycling technology and mechanisms to support the collection, sorting and processing of used textile materials. They can work to scale viable solutions and ensure that solutions are designed to be scalable, particularly considering the volumes and locations of materials needed to support a variety of producers and brands.

**Financial institutions** can support funding for innovation in raw materials, not only for innovative fibres but also for technical solutions, improved practices and recycling solutions in existing materials. They can implement clear process for project assessment as soon as possible in the development process, and use appropriate and effective metrics (developed by experts) to understand the potential sustainability benefits and real scalability of solutions as they invest in them.

**NGOs and technical organizations** can work with farming groups, foresters and extractives actors to share best practices, and provide technical and financial support for implementation. They can support the development of credible and efficient voluntary certification, and work with policymakers to implement better practices in agriculture, forestry and extractives.

**Box 13: Case studies – Raw materials**

**Producer example:** Chetna Organic is an organic cotton co-op group in India supporting over 15,000 cotton farming families across more than 400 Indian villages in Maharashtra, Odisha and Telangana. Chetna Organic has partnered with Gallant International, a US-based company and their factory partners to scale the certification of Chetna Organic farms to Regenerative Organic Certified (ROC), across 3,500 acres in 2021. The adoption of the more holistic regenerative organic approach was praised by both Chetna Organic and Gallant, supporting smallholder cotton farmers while demonstrating that non-GMO cotton can be grown in India without synthetic chemicals and pesticides. Gallant now offers woven shirts, knitwear, bags and accessories made with ROC cotton and with direct traceability back to Chetna Organic co-ops.

**Innovator and recycler examples:** The European Union defines industrial symbiosis as “the process by which wastes or by-products of an industry or industrial process become raw materials for another.”<sup>120</sup> Textile raw material producers are implementing industrial symbiosis processes to develop innovative textile raw materials in partnership with other sectors, predominantly with the food industry. One example is Pine Kazi, a Kenyan social business that converts pineapple waste that would otherwise have been thrown into landfill or burned into shoes and bags. In addition to converting resources from waste, this process has a lower environmental impact than cow leather, and supports local communities by creating an additional income stream. The company won the African Development Bank’s Fashionomics Africa Contest in 2021.<sup>121</sup>

Another material applying this approach is Orange Fiber, which uses waste from citrus juice production, and extracts cellulose to produce fibre and fabrics. Orange Fiber was one of companies selected for the Fashion For Good Plug & Play Accelerator programme, and it has since launched collaborations with Lenzing to develop the first TENCEL branded lyocell material using orange pulp and wood sources.

**Financial institution example:** Closed Loop Partners (CLP) is a New York-based investment firm seeking to catalyse the creation of circular supply chains, comprised of venture capital, growth equity, private equity and catalytic capital, and an innovation centre focused on building the circular economy. For the textile industry specifically, CLP invests in early-stage growth companies engaged in circular fashion, material science, supply chain technology, and food and agriculture technology. This includes Browzwear, a 3D fashion design, development and merchandising software platform, The Renewal Workshop, an apparel refurbishment service for products with minor damages enabling companies to sell previously unsalable inventory, EVRNU, a fibre technology company converting garment waste into high-quality recycled fibre, as well as in multiple molecular recycling technology organizations, including JEPLAN, a depolymerization technology company leveraging large quantities of discarded clothing into their molecular recycling technology process.

*Mention of an initiative, commercial company or product in this document does not imply endorsement by the United Nations Environment Programme or the authors.*

<sup>120</sup> European Cluster Collaboration Platform (n.d.) Industrial symbiosis toolkit.

<sup>121</sup> Fashionomics Africa (2021). Pine Kazi: Turning Waste into Trendy Footwear.





## 3.8 Significant improvements in shared infrastructure are made globally for a sustainable and circular textile value chain

WRI and Aii estimate that a complete shift to renewable energy in tiers 1-3 could result in 424 Mt of reduced GHG emissions,<sup>122</sup> while GFA and McKinsey estimate that the same outcome will result in 653 Mt of reduced GHG emissions.<sup>123</sup>

**Significant investment in shared infrastructure is needed across the textile value chain – in both consumption and production regions – to support a transformation to sustainable and circular systems, aligned with UNEP's International Good Practice Principles for Sustainable Infrastructure.<sup>124</sup> Without investment in shared infrastructure, including renewable energy, waste management and water treatment individual actors are limited in their potential to contribute. On-site investment for producers and raw materials actors is addressed in sections 3.5 and 3.7.**

### KEY ACTIONS

**Renewable energy infrastructure** is rolled out across the whole value chain and countries significantly reduce GHG emissions. Priorities include increasing renewable energy capacity in national grids, solutions that include private sector purchases of renewable energy (such as power purchase agreements), and decentralized shared renewable infrastructure (for example rural microgrids or captive renewable energy power for industrial parks) to ensure that users of shared power infrastructure can rapidly transition to renewable energy. A focus is placed on wind, solar and wave technology, with minimal environmental and social trade-offs, with hydropower considered only where there is low environmental and social impact.

**Waste collection and processing capacity** is installed in consumption and production countries, ensuring that both pre- and post-consumer waste are effectively managed. This includes collecting and sorting mechanisms (such as road-side collection for consumers, collection from factories for pre-consumer waste, sorting infrastructure to separate material types, and managing data on inputs), as well as processing and recycling infrastructure that reflects the waste hierarchy (such as reuse and upcycling systems, and then recycling technologies for separating blends, mechanical recycling mechanisms or low-impact chemical recycling mechanisms). Infrastructure is implemented globally to support equitable development, waste capture and revenue from recycling solutions.

**Water treatment infrastructure** is strengthened in both production and consumption countries to ensure that key pollutants are addressed and challenges with municipal and industry effluent treatment plants are resolved. In production countries, industrial effluent treatment infrastructure is implemented and improved (particularly in industrial park or cluster locations) to allow for water reuse, the elimination of wastewater emissions and process microfibre

<sup>122</sup> WRI (2021). Roadmap to Net Zero: Delivering Science-Based Targets in the Apparel Sector.

<sup>123</sup> McKinsey and GFA (2020). Fashion on Climate.

<sup>124</sup> UNEP (2021b). International Good Practice Principles for Sustainable Infrastructure.

shedding, and support recapture of chemical inputs where feasible. Improved wastewater processing in consumption regions improves filtering capacity and eliminates wastewater and microfibre emissions from product use.

## THE ROLE OF DIFFERENT STAKEHOLDERS

**Policymakers** can increase public investment in shared infrastructure such as renewable energy assets, shared wastewater treatment facilities and textile collection and recycling. They can support private sector investment in required infrastructure through effective financial and planning process and support, and remove barriers to investment in infrastructure such as legal barriers, corruption or inadequate technical support. They can work through innovative financial models – such as PPPs or green bonds – to provide funding for infrastructure investment.

**Financial institutions** can create internal organizational strategies, knowledge and capacity on sustainable infrastructure investment. They can create goals and embed these goals and responsibilities in senior-level discussions and their risk policies, product development and client engagement. They can create new approaches to funding, including blended finance, system-level aggregation of financial needs, digital solutions, alternative mechanisms for demonstrating creditworthiness, smaller scale funding appropriate for developing country contexts, and early seed funding.

### Box 14: Case studies - Infrastructure

#### **Policymaker example:**

The City of Copenhagen has joined forces with five partners to test and showcase a transparent and circular model for post-consumer textile systems, including all of the processes and infrastructure needed to make it function. The partners have collaborated to provide systems for an entire circular value chain: collection of household textiles, sorting, reuse (repair, redesign, resell), recycling and production of new yarns/fabrics, textile supply and procurement. The city is also partnering with SOEX and I:CO spirit to develop a deep understanding of post-consumer textile compositions and recycling options and the potential for automatic sorting. Initial findings from this partnership indicate that the lack of standards for the products coming out of sorting operations for non-wearables hampers the establishment of a well-functioning market, and that there is a need to develop industry standards for sorted and baled recyclable textile qualities.

#### **Technical organization example:**

The International Finance Corporation (IFC) Green Bond Technical Assistance Program (GB-TAP) aims to stimulate the supply of green bonds in emerging markets by creating and disseminating best practice and knowledge as global public goods. It has created a Green Bond Handbook to provide a step-by-step technical guideline to potential issuers, including governmental organizations looking to provide investment in infrastructure improvements. It particularly focuses on structuring a Green Bond in compliance with the International Capital Market Association (ICMA) Green Bond Principles.

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## 3.9 All textile waste is diverted from avoidable landfill and incineration

GFA and McKinsey estimate that increased recycling and collection of textile waste could drive annual CO<sub>2</sub> emissions abatement of around 18 million tons, reducing incineration and landfill and moving the industry towards a closed loop system.<sup>125</sup>

**Significant shifts are needed to divert waste from landfill and incineration. Consumer behaviour and global dynamics need to shift 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.<sup>126</sup> Banning incineration for non-contaminated products (including unsold stock) could also ensure that textile resources are not wasted and are kept in use longer.**

### KEY ACTIONS

**Textile waste is diverted from landfill globally** and managed responsibly to supply fibre-to-fibre recycling or other optimized recycling and reuse purposes. Consumer behaviour in particular is adjusted so that textile products are diverted according to the waste hierarchy,<sup>127</sup> prioritizing reuse and resale, followed by recycling and repurposing. Global trade dynamics are examined and countries receiving waste they cannot process are supported to create effective solutions for recycling, recovery, enact other safe solutions or redirect and eliminate waste flows.

**Textile incineration or destruction is prevented** except in cases of extreme contamination. Textiles are reused, recycled or repurposed instead of incinerated or destroyed. Where contamination makes products non-viable for further use, disposal is carried out in line with [Basel Convention requirements](#) and the Human Rights Council [Guidelines for good practices for disposal of toxics](#). Where hazardous waste can be repurposed in an environmentally safe manner that is within all legal restrictions and best practices on disposal, this should be explored.

### THE ROLE OF DIFFERENT STAKEHOLDERS

**Brands and retailers** can support the development of effective textile waste management systems, through funding to innovative solutions, engaging consumers on how to manage textile waste, and potentially offering recycling or reuse solutions directly as a medium-term solution. They can also ensure that they have a robust policy on dealing with unsold stock, counterfeit stock and other common situations where they are required to directly manage potential waste streams, so that incineration and landfill are not seen

<sup>125</sup> McKinsey and GFA (2020). Fashion on Climate.

<sup>126</sup> BBC News (2021). Fast fashion: The dumping ground for unwanted clothes.

<sup>127</sup> UNEP (2013). Global Environment Outlook: Healthy Planet, Healthy People.

as solutions to these issues. Instead, they can create collaborations with other stakeholders to assess and redirect these materials, and provide suitable and safe disposal methods for those materials that are too contaminated to be processed any other way.

**Innovators and recyclers** can provide better waste management solutions including solutions that divert from landfill or incineration for brands, consumers and potentially for municipal waste disposal organizations. They can work with experts to monitor the flow and availability of textiles resources, and leverage market analysis to identify opportunities for new solutions to address particularly important segments of the market. They can explore suitable solutions for handling and even repurposing hazardous waste streams, in collaboration with other industries and experts on safety and relevant legal requirements.

**Communication and consumer engagement actors** can engage consumers on alternative behaviours, solutions or technologies that will enable them to avoid sending items to landfill, with a focus on keeping items in use as long as possible, and ensure that management of used products away from landfill becomes the norm.

**Policymakers** can create incentives for companies to divert from landfill, including extended producer responsibility (EPR) or other tax schemes that are focused on encouraging a shift in behaviour of brands and retailers towards circular models, designs and solutions, bans on specific behaviour or incentives towards innovative solution development. They can engage consumers on behaviour change, particularly if in combination with improved textile waste handling solutions both from the public or private sector side. They can support effective waste handling processes through aligned regional or global mechanisms for identifying materials, inputs and other key sorting information, set regulations on the destruction of unsold goods, and clearly regulate the acceptable conditions for management of hazardous products where incineration is disincentivized.

### Box 15: Case studies – Waste management

**NGO, brand and producer example:** The Circular Fashion Partnership is a sector-wide collaboration by the Global Fashion Agenda with brands, manufacturers and recycling organizations working together in circular commercial collaborations to valorise the magnitude of post-industrial textile waste in manufacturing regions. This partnership has supported the further development of the textiles recycling industry in Bangladesh, creating new recycled textile raw materials for new products and is currently being established in Cambodia and Viet Nam. The partnership also engages regulators, as well as investors to address the current barriers of scaling waste collection, sorting and recycling infrastructures to capture economic and sustainability opportunities and proactively shape the circular textiles economy from a manufacturing perspective. The programme aims to decrease virgin material use, increase uptake of recycled materials, and provide a robust business case for expansion to more countries.

**Policymaker example:** In 2020, France implemented an anti-waste and circular economy bill, aiming to eliminate waste and pollution from the design stage and transform the system of production, distribution and consumption from a linear to a circular economic model. As part of this bill, new regulations are coming into place to ensure that fashion and textile companies provide consumers with information revealing the environmental impact of products sold, and to prohibit the destruction of new, unsold textile merchandise except where they represent a health hazard. According to the French Agency for Ecological Transition, unsold textiles stock was worth 1.7 billion euros in France in 2019, equivalent to 4.1 per cent of the industry's turnover. 5 per cent of this unsold stock was destroyed, with 23 per cent sold at a discount through other organizations, 20 per cent donated to charities, and 10 per cent upcycled or recycled. Those currently destroying unsold stock for whatever reason will now be obligated to use one of these other options, or to find innovative solutions for unsold stock that does not result in its destruction.

*Mention of an initiative, commercial company or product in this document does not imply endorsement by the United Nations Environment Programme or the authors.*







# 4

## What is needed to deliver the building blocks?

Based on analysis of existing goals, initiatives, and activities, and acknowledging the many organizations already working to convene action at global level on specific areas of ‘conventional’ sustainability (i.e. not circularity) in the textile value, certain specific additional structures would support the transition to a sustainable and circular textile value chain at a global level.

In particular, for circularity, there are no identified, open access, global structures to support coordination between policymakers, brands, and other key stakeholders on the key challenges of the transition to circular systems, or set and monitor plans. **There is a need for a coordination mechanism to give cohesion and a focal point to support the delivery of existing work and encourage other actors to participate and address further gaps.**

The goal of such coordination is to help facilitate dialogue between actors, setting and monitoring targets and plans, support the development of data and decision support tools to help evaluate progress, and coordinate existing action on circularity. The aim is not to replicate existing efforts but rather to provide a forum for existing activities and collaboration on addressing gaps. Close coordination with existing initiatives will help drive action, recognizing and connecting to existing mechanisms on ‘conventional’ sustainability.

### How is UNEP currently supporting coordination?

UNEP convenes an *expert community* on sustainability and circularity in the textile value chain with over 850 members from all regions. The objective of the expert community is to share knowledge and foster collaboration, including through a repository of relevant initiatives and publications, and regular newsletter updates. Members of this expert community may also be called on for their insights and guidance, as was the case in the crucial consultation process of this report.

### How will UNEP further support coordination?

UNEP is well placed to deliver global coordination – jointly with its partners – under its *Textile Flagship Initiative*. UNEP’s Textile Flagship Initiative aims to trigger system change to accelerate the just transition towards a sustainable and circular textile value chain, as outlined in this report. The initiative has a strong partnership approach to avoid duplication and support existing initiatives to scale the impact of their work.

Gaps that coordination efforts must address are outlined below. Working to close these gaps will support stakeholders across the value chain to collaborate to deliver both on their own activities and shared goals.

## Shared global industry targets

A set of agreed industry targets should be put forward to set a clear agenda and effectively monitor progress. Where targets already exist, these should be explicitly recognized with information on how they are being monitored. Where gaps exist, or targets can be made more specific or measurable, stakeholders should collaborate to add or clarify targets, or supporting organizations should set these targets and commit to measuring them. Existing assessment and reporting mechanisms should be leveraged wherever possible to streamline monitoring and reporting at the industry level.

### How is UNEP currently supporting the development of aligned industry targets?

*The Global Fashion Agenda is working to identify and align the industry around directional targets under the Fashion CEO Agenda priority framework. In this context, UNEP is partnering with GFA on a global consultation that seeks to identify and converge existing industry aligned targets as well as formulating new targets where targets are currently missing to provide an industry aligned route of travel in line with the building blocks and priorities set out in this report, as well as UNFCCC 1.5°C pathway and GFA's vision of a net-positive fashion industry that gives back more to society, the natural world and the economy than it takes out. This includes the development of circularity targets.*

## Cohesive global policy response and formalized measurable national plans

Policymakers in key production and consumption countries should be facilitated to identify and address synergies and geographical trade-offs from (potential) global and national policy interventions, and forge cooperative trans-national efforts and a global policy response on circular textiles. Such facilitation should take place through existing structures, and can leverage existing international forums.

Policymakers should also create (or update) measurable national action plans for circular textiles in collaboration and consultation with a range of relevant national and international stakeholders including financial institutions, brands and producers to ensure alignment and long-term certainty, while understanding how well their strategy matches the global roadmap laid out in this report and key regional priorities.

Dialogue should also be facilitated between public and private sector to ensure that approaches are coordinated, and the complexities of private sector progress requirements are shared with policymakers.

### How is UNEP currently supporting policymakers to create strategies on sustainable and circular textiles?

*There are existing structures that can be leveraged to support policymakers on setting and implementing strategies for sustainable and circular textiles: The United Nations Environment Assembly is the world's highest-level decision-making body on the environment, with a universal membership of all 193 Member States. The Assembly meets biennially to set priorities for global environmental policies and develop international environmental law. Through its ministerial declaration and resolutions, the Assembly provides leadership, catalyses intergovernmental action on the environment, and may serve as an appropriate forum for high-level policy alignment. In response to UNEA resolution 4/1,<sup>128</sup> UNEP is also working, through its EU-funded InTex project, to provide evidence of the environmental and socioeconomic impacts of the different sustainable economic models in the textile value chain, to help bridge the science-policy gap and raise awareness on the potential impacts of adopting and fostering innovative sustainable and circular policies and practices.*

*The Global Alliance on Circular Economy and Resource Efficiency (GACERE)<sup>129</sup> is an alliance of governments working together on and advocating for a global just circular economy transition and more sustainable management of natural resources at the political level and in multilateral forums. One of its working areas is to take forward and support sectoral partnerships for the circular economy transition to disseminate best practices while avoiding duplication.*

*UNEP is further supporting governments in various regions to strengthen their policies on sustainable and circular textiles.*

<sup>128</sup> UNEP (2019b). Innovative pathways to achieve sustainable consumption and production.

<sup>129</sup> GACERE is an initiative of the European Commission on behalf of the European Union and the United Nations Environment Programme, in coordination with the United Nations Industrial Development Organization.

## Data and improved analysis tools for effective decision-making

The lack of impact data on various elements of circularity policy, models and design is a barrier to effective decision-making for both companies and policymakers. Data is crucial in furthering transparency and traceability efforts, which are key to achieving all of the building blocks presented in this report. It should be an urgent priority to gather more complete, relevant, and specific impact data (as well as creating tools for analysis) to facilitate progress and avoid unintended consequences of circular solutions and policies. This data should be made available without existing barriers (paywalls, membership commitments) to ensure access for all stakeholders. All data gathering should build on existing work and data sources and link to initiatives already exploring data solutions. It could be supported and carried out by a wide range of stakeholders in a coordinated way to ensure that data sources and resulting analysis and tools are consistent with each other and adhere to an agreed framework and methodology.

### How is UNEP currently supporting data gathering and methodologies?

UNEP (through its *Life Cycle Initiative* and the *Global LCA Data Access network*) is increasing the access to environmental and lifecycle data so that textiles businesses and policymakers can make better informed decisions and implement relevant strategies. UNEP's work on providing impact evidence of different textile value chain models outlined above also contributes to data.

## Knowledge on consumer communications and behaviour

Current communication from both the public and private sector on circular textiles often fails to leverage psychological insights for effective engagement of consumers and citizens. To address this, leading communication and research organizations can support private and public sector actors to effectively engage with consumers and citizens. This can be done through tools and solutions that support dissemination of key messages, gathering of data on targeted and appropriate messages to consumers, and culturally and psychologically relevant approaches to incentivize a diverse range of people to shift expectations, values and behavior.

## How is UNEP currently supporting effective consumer communication?

UNEP is releasing in June 2023 a new playbook for sustainable fashion communication that unites and aligns communicators towards the Paris Agreement and wider UN Sustainable Development Goals. This has resulted in a communication commitment integrated in the renewed UNFCCC Fashion Charter shared at COP26, and is a first step to promoting a new narrative directed towards a positive fashion future. The playbook will serve as a published guideline outlining how communication must be a driving force in fashion's sustainable transition with specific guidance and examples of best practice for implementation and measurement. It acknowledges the confusion or greenwashing that currently exists within sustainability communication as well as the cultural power the fashion sector has through its storytelling and visual language, and the role renewed aspiration could play to avert the triple planetary crisis. Its development and launch are an opportunity for greater stakeholder engagement and education, and a deliverable of UNEP's Sustainable Fashion Communication Strategy.<sup>130</sup>

<sup>130</sup> UNEP (2021c). Sustainable Fashion Communication Strategy 2021-2024.







# 5

## Conclusions

Unsustainable production and consumption is the common thread between the triple planetary crisis of climate change, nature loss and pollution.<sup>131</sup> All efforts must be made to transform the textile value chain towards sustainability and circularity, where it should act as a crucial lever for an overall transformation to a circular economy.

This transformation will require a degree of coordination, investment, regulation and business model adaptation that has never been seen before, while creating new models and opportunities for all. If all efforts are made in alignment with the recommendations from this report, the textile value chain would contribute to addressing the triple planetary crisis through reaching net zero emissions (climate), preserving biodiversity and achieving a net-positive balance (nature), and significantly reducing resource use and pollution arising from the textile value chain and moving towards zero waste (pollution and waste).

Implementing the building blocks outlined in this roadmap could have significant impacts, including:

- Circular business models could enable the industry to eliminate approximately 143 million tons of GHG emissions in 2030.<sup>132</sup>
- Reducing overproduction by even 10 per cent could reduce emissions by approximately 158 million tons in 2030, while eliminating all overproduction would result in a significantly greater benefit.<sup>133</sup>
- Doubling the average uses of a garment could reduce GHG emissions by 44 per cent.<sup>134</sup>
- Improving energy efficiency by 15 per cent per production unit in the processing phase of the value chain has a potential benefit of 64 Mt CO<sub>2</sub>e between 2019 and 2030.<sup>135</sup>
- Transitioning towards a circular economy across sectors could create a net total of 6 million new jobs by 2030, compared to a business-as-usual scenario.<sup>136</sup>

<sup>131</sup> UNEP (2020). Triple planetary crisis: forging a new relationship between people and earth.

<sup>132</sup> McKinsey and GFA (2020). Fashion on Climate.

<sup>133</sup> McKinsey and GFA (2020). Fashion on Climate.

<sup>134</sup> EMF (2017). A new textiles economy: Redesigning fashion's future.

<sup>135</sup> WRI and Aii (2021). Roadmap to Net-Zero: Delivering Science-Based Targets in the Apparel Sector.

<sup>136</sup> ILO (2018). World Employment Social Outlook 2018: Greening with Jobs.



Data is still needed to fully quantify the benefits of the nine building blocks, including a need to supplement metrics on climate with a range of additional data on other environmental, social and economic benefits.

Policymakers have a key role to play in creating a level regulatory playing field for the private sector, addressing policy barriers to action, creating effective incentives for change, and investing in key infrastructure. Their decisive leadership will enable all other actors to drive ambitious change.

It also remains critical that consumers and citizens should be supported to take part in this systematic shift. The private sector as well as those who communicate to consumers and citizens specifically must play a strong role in creating and communicating a more sustainable and circular textile value chain, while also moving towards a more just and equitable system. This includes the wider landscape of brands, advertisers, media, influencers and more who reach their audiences most frequently, who must become part of the solution to develop and perpetuate a new narrative for the sector, building demand, shaping desire and demanding change from all stakeholders globally.

UNEP aims to provide leadership and convene partners to advance towards a sustainable and circular textile value chain. This will contribute to achieving the 2030 Agenda for Sustainable Development, especially SDG 12 on responsible consumption and production and many of the other SDGs. This report has laid out a roadmap of shared priority actions needed to advance sustainability and circularity in the textile value chain. The next steps are twofold:

The first action is to explore how UNEP can use its neutral position to support the textile value chain in coordinating and in delivering action at scale on circularity under its Textile Flagship Initiative. This will be explored in collaboration with leading organizations working on circularity in the textile value chain, with a particular focus on the ways to facilitate global policy coordination, making clear links to the programmes of existing initiatives on circularity and conventional sustainability.

The second action – in support of the United Nations Environment Assembly (UNEA)-4 Resolution 1 on “Innovative pathways to achieve sustainable consumption and production” adopted in March 2019 – is to build on these findings to provide quantitative analyses of the environmental, economic and social outcomes of diverse sustainable and circular pathways for the textile industry. This analysis can support both public and private stakeholders in prioritizing actions and understanding potential global trade-offs from specific interventions.

UNEP thanks all of the stakeholders who kindly shared their feedback for this report and helped shape its recommendations, and looks forward to continuing to engage with governments, businesses, civil society and other actors to advance this agenda.

## References

American Apparel and Footwear Association (2022). Apparel Stats & Shoe Stats 2022: Significant Industry Data. Available at: <https://www.aafaglobal.org/AAFA/Media.aspx>

Apparel Impact Institute and Fashion for Good (2021). Unlocking the Trillion Dollar Fashion Decarbonisation Opportunity. Available at: <https://reports.fashionforgood.com/wp-content/uploads/2021/11/REPORT-Unlocking-The-Trillion-Dollar-Fashion-Decarbonisation-Opportunity-Fashion-for-Good-Aii.pdf>

BBC News (2021). Fast fashion: The dumping ground for unwanted clothes. Retrieved from <https://www.bbc.co.uk/news/av/world-africa-58836618>

Better Cotton (2015). Key Facts. Available at: [https://bettercotton.org/wp-content/uploads/2015/02/BCI-Key-Facts-2015\\_2.pdf](https://bettercotton.org/wp-content/uploads/2015/02/BCI-Key-Facts-2015_2.pdf)

Business for Social Responsibility and Laudes Foundation (2021). Keeping Workers in the Loop: Preparing for a Just, Fair, and Inclusive Transition to Circular Fashion. Available at: <https://www.bsr.org/en/reports/circular-fashion-keeping-workers-in-the-loop>

— (2017). Empowering Female Workers in the Apparel Industry. Available at: [https://www.bsr.org/reports/BSR\\_Empowering\\_Female\\_Workers\\_in\\_the\\_Apparel\\_Industry.pdf](https://www.bsr.org/reports/BSR_Empowering_Female_Workers_in_the_Apparel_Industry.pdf)

Business Human Rights (2022). Unbearable harassment: The fashion industry and widespread abuse of female garment workers in Indian factories. Available at: <https://www.business-humanrights.org/en/from-us/briefings/unbearable-harassment/>

CDP (2020). Interwoven Risks, Untapped Opportunities. Available at: <https://www.cdp.net/en/research/global-reports/interwoven-risks-untapped-opportunities>

CEO Water Mandate (n.d.). About Six Commitment Areas. Available at: <https://ceowatermandate.org/about/six-commitment-areas/>

Cham, T.H., Ng, C.K.Y., Lim, Y.M. and Cheng, B.L. (2017). Factors influencing clothing interest and purchase intention: a study of Generation Y consumers in Malaysia. Available at: <https://core.ac.uk/download/pdf/148366899.pdf>.

Changing Markets Foundation 2021. Synthetic Anonymous. Fashion brands' addiction to fossil fuels. Available at: [http://changingmarkets.org/wp-content/uploads/2021/07/SyntheticsAnonymous\\_FinalWeb.pdf](http://changingmarkets.org/wp-content/uploads/2021/07/SyntheticsAnonymous_FinalWeb.pdf)

Circle Economy (2020). Clothing Labels: Accurate or Not?. Available at <https://www.circle-economy.com/resources/clothing-labels-accurate-or-not>

Circular Design Guide (n.d.). Methods. Available at: <https://www.circulardesignguide.com/methods>

Common Objective (n.d.). Volume and Consumption: How Much Does the World Buy?. Available at: <https://www.commonobjective.co/article/volume-and-consumption-how-much-does-the-world-buy>

Ellen MacArthur Foundation (2021). Fashion Business Models: Overview. Available at: <https://ellenmacarthurfoundation.org/fashion-business-models/overview>

— (2021a). Circular Business Models: Redefining Growth for a Thriving Fashion Industry. Available at: <https://ellenmacarthurfoundation.org/news/circular-business-models-in-the-fashion-industry>

— (2021b). Circular Examples: France's Anti-waste and Circular Economy Law. Available at: <https://ellenmacarthurfoundation.org/circular-examples/frances-anti-waste-and-circular-economy-law>

— (2020). Vision of a Circular Economy. Available at: <https://emf.thirdlight.com/link/nbfff6ugh01m-y15u3p/@/preview/1?o>

— (2018). Circular Design Guide Methods. Available at: <https://www.circulardesignguide.com/methods>

— (2017). A New Textiles Economy: Redesigning Fashion's Future. Available at: <https://ellenmacarthurfoundation.org/a-new-textiles-economy>

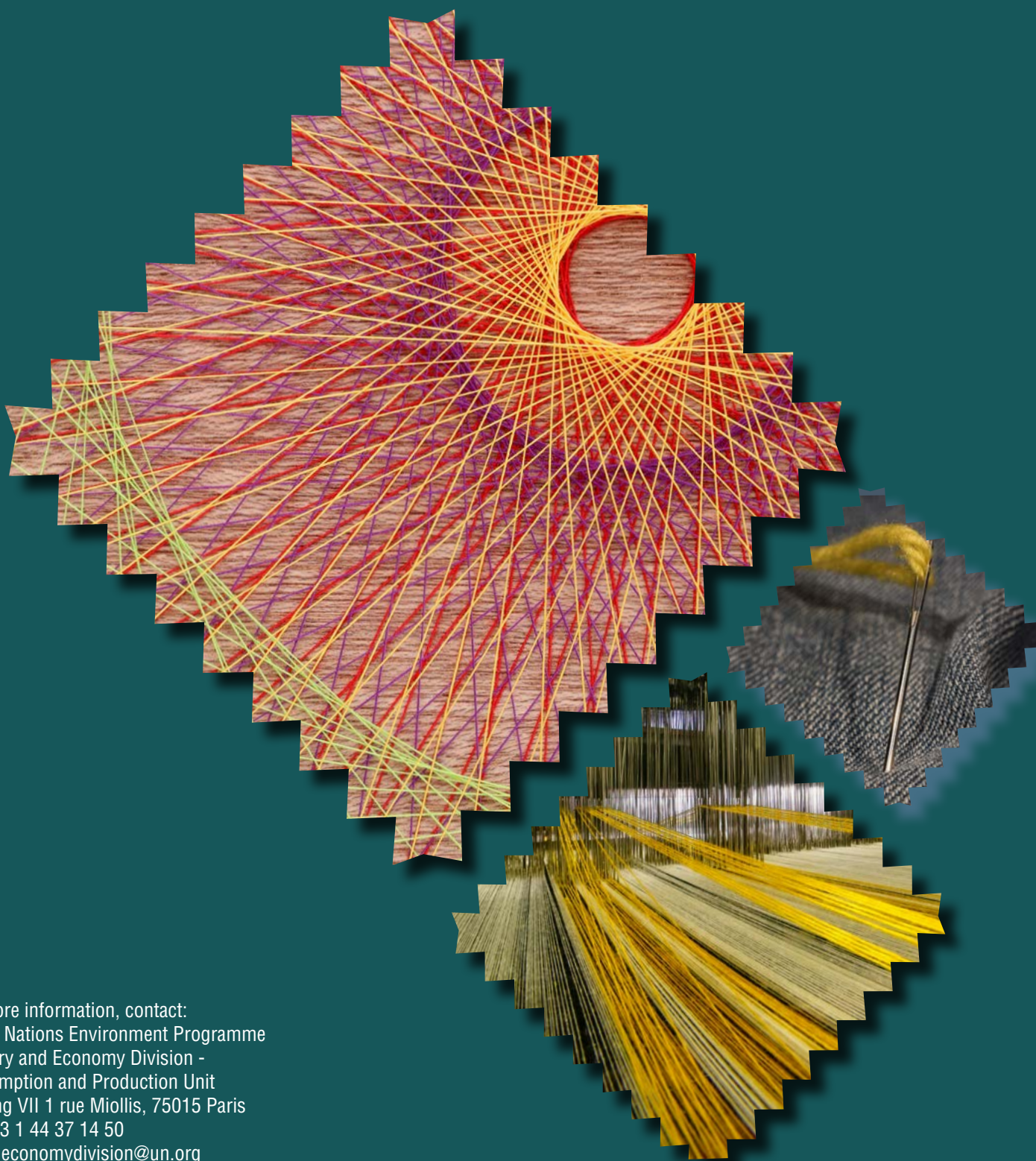
- European Cluster Collaboration Platform (n.d.). Industrial symbiosis toolkit. Available at: <https://clustercollaboration.eu/green/knowledge-base/industrial-symbiosis-toolkit>
- Fair Wear Foundation (2013). Standing Firm Against Factory Floor Harassment. Available at: <https://api.fairwear.org/wp-content/uploads/2016/06/StandingFirmReportFWF2013.pdf>
- Fashion for Good and the Boston Consulting Group (2020). Financing the Transformation: Fashion for Good. Available at: [https://fashionforgood.com/wp-content/uploads/2020/01/FinancingTheTransformation\\_Report\\_FINAL\\_Digital-1.pdf](https://fashionforgood.com/wp-content/uploads/2020/01/FinancingTheTransformation_Report_FINAL_Digital-1.pdf)
- The Fashion Pact (2020). First Steps to Transform Our Industry. Available at: <https://www.thefashionpact.org/download?id=386&n=038906e111abca13dce4c77d419e4f21-pdf>
- (n.d.). About the Fashion Pact. Available at: <https://thefashionpact.org/>
- Fashion Revolution (2020). Why We Still Need a Fashion Revolution. Available at: <https://www.fashionrevolution.org/why-do-we-need-a-fashion-revolution/>
- (n.d.). Fashion's Future: The Sustainable Development Goals. Available at: <https://www.fashionrevolution.org/join-our-free-online-course-fashions-future-and-the-sustainable-development-goals/>
- Fashionomics Africa (2021). Pine Kazi: Turning Waste into Trendy Footwear. Available at: <https://fashionomicsafrica.org/journals/pine-kazi-turning-waste-into-trendy-footwear>
- Futerra (n.d.). Transparency: The Honest Generation. Available at: <https://www.wearefuterra.com/thinks/the-honest-generation>
- Global Fashion Agenda (2022). Fashion Industry Target Consultation. Available at: <https://globalfashionagenda.org/fashion-industry-target-consultation/>
- (2017). Pulse of the Fashion Industry. Available at: <https://globalfashionagenda.org/impact-initiatives/pulse-of-the-industry/>
- Heath, R. & Mushfiq, M (2015). Manufacturing growth and the lives of Bangladeshi women. *Journal of Development Economics*. 115(C), 1-15. Available at: <https://www.sciencedirect.com/science/article/abs/pii/S0304387815000085>
- Heffer, P (2013). Assessment of Fertilizer Use by Crop at the Global Level. Available at: <https://www.fertilizer.org/wp-content/uploads/2023/01/AgCom.13.39-FUBC-assessment-2010.pdf>
- Hot or Cool Institute (2022). Unfit, Unfair, Unfashionable: Resizing Fashion for a Fair Consumption Space. Available at: [https://hotorcool.org/wp-content/uploads/2022/12/Hot\\_or\\_Cool\\_1\\_5\\_fashion\\_report\\_.pdf](https://hotorcool.org/wp-content/uploads/2022/12/Hot_or_Cool_1_5_fashion_report_.pdf).
- ILO (2022). The State of the Apparel and Footwear Industry: Employment, automation and their gender dimensions. Available at: [https://www.ilo.org/wcmsp5/groups/public/---ed\\_emp/documents/publication/wcms\\_835423.pdf](https://www.ilo.org/wcmsp5/groups/public/---ed_emp/documents/publication/wcms_835423.pdf)
- ILO (2022a). Sectoral Policies for a Just Transition towards Environmentally Sustainable Economies and Societies for All. Available at: [https://www.ilo.org/global/topics/green-jobs/publications/just-transition-pb/WCMS\\_858856/lang--en/index.htm](https://www.ilo.org/global/topics/green-jobs/publications/just-transition-pb/WCMS_858856/lang--en/index.htm)
- (2021). Exposure to hazardous chemicals at work and resulting health impacts: A global review. Available at: [https://www.ilo.org/wcmsp5/groups/public/---ed\\_dialogue/---lab\\_admin/documents/publication/wcms\\_811455.pdf](https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---lab_admin/documents/publication/wcms_811455.pdf)
- (2021a). A "Just Transition Toolkit" for textile and garment supply chain in Asia. Available at: [https://ilo.org/asia/media-centre/news/WCMS\\_806222/lang--en/index.htm](https://ilo.org/asia/media-centre/news/WCMS_806222/lang--en/index.htm)
- (2018). World Employment Social Outlook 2018: Greening with Jobs. Available at: [https://www.ilo.org/global/publications/books/WCMS\\_628654/lang--en/index.htm](https://www.ilo.org/global/publications/books/WCMS_628654/lang--en/index.htm)
- (2016). Weak minimum wage compliance in Asia's garment industry. Available at: [https://www.ilo.org/wcmsp5/groups/public/---ed\\_protect/---protrav/---travail/documents/publication/wcms\\_509532.pdf](https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---travail/documents/publication/wcms_509532.pdf)
- (2015). Guidelines for a just transition towards environmentally sustainable economies and societies for all. Available at: [https://www.ilo.org/wcmsp5/groups/public/@ed\\_emp/@emp\\_ent/documents/publication/wcms\\_432859.pdf](https://www.ilo.org/wcmsp5/groups/public/@ed_emp/@emp_ent/documents/publication/wcms_432859.pdf)
- (2015a). Transition from the Informal to the Formal Economy, Recommendation 204. Available at: [https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100\\_ILO\\_CODE:R204](https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:R204)
- (2015b). The future of work in textiles, clothing, leather and footwear. ILO Working Paper 326. Available at: [https://www.ilo.org/sector/Resources/publications/WCMS\\_669355/lang--en/index.htm](https://www.ilo.org/sector/Resources/publications/WCMS_669355/lang--en/index.htm)

- (2014). Promoting Rights at Work through Social Dialogue.
- (n.d.). Decent Work. Available at: <https://www.ilo.org/global/topics/decent-work/lang--en/index.htm>
- (n.d.a). Skills for a Greener Future. Available at: [https://www.ilo.org/skills/pubs/WCMS\\_732214/lang--en/index.htm](https://www.ilo.org/skills/pubs/WCMS_732214/lang--en/index.htm)
- Intergovernmental Panel on Climate Change (2022). Climate Change 2022: Mitigation of Climate Change. Available at: [https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC\\_AR6\\_WGIII\\_FullReport.pdf](https://www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_FullReport.pdf)
- (2021). Climate Change 2021: The Physical Science Basis. Available at: <https://www.ipcc.ch/report/ar6/wg1/>
- International Resource Panel (2017). Resource Efficiency: Potential and Economic Implications. Available at: [https://www.resourcepanel.org/sites/default/files/documents/document/media/resource\\_efficiency\\_report\\_march\\_2017\\_web\\_res.pdf](https://www.resourcepanel.org/sites/default/files/documents/document/media/resource_efficiency_report_march_2017_web_res.pdf)
- Karpova, E (2016). Don't buy this jacket: Patagonia's daring campaign. Available at: [https://libres.uncg.edu/ir/uncg/f/E\\_Karpova\\_Dont\\_2016.pdf](https://libres.uncg.edu/ir/uncg/f/E_Karpova_Dont_2016.pdf)
- Longo, C., Shankar, A. & Nuttall, P. (2019). It's Not Easy Living a Sustainable Lifestyle: How Greater Knowledge Leads to Dilemmas, Tensions and Paralysis. *Journal of Business Ethics* 154, 759–779. Available at: <https://doi.org/10.1007/s10551-016-3422-1>
- Maslow, A.H (1943). A Theory of Human Motivation. *Psychological Review*, 50 (4), 430-437.
- McKinsey & Company (2020). Biodiversity: The next frontier in sustainable fashion. Available at: <https://www.mckinsey.com/industries/retail/our-insights/biodiversity-the-next-frontier-in-sustainable-fashion>
- McKinsey & Company and Global Fashion Agenda (2021). Scaling Circularity. Available at: <https://globalfashionagenda.org/resource/scaling-circularity-report/>
- (2020). Fashion on Climate. Available at: <https://globalfashionagenda.org/fashion-on-climate/>
- Microfibre Consortium (n.d.). The Microfibre Roadmap. Available at: <https://www.microfibreconsortium.com/roadmap>
- OECD (2022). Draft Recommendation on the Role of Government in Promoting Responsible Business Conduct. Available at: <http://mneguidelines.oecd.org/Draft-recommendation-on-the-role-of-government-in-promoting-responsible-business-conduct.pdf>
- (2021). Multinational Enterprises Guidelines. Available at: <https://www.oecd.org/corporate/mne/>
- (2021a). Responsible Supply Chains in the Textile and Garment Sector. Available at: <https://www.oecd.org/industry/inv/mne/responsible-supply-chains-textile-garment-sector.htm>
- (2018). Due Diligence Guidance for Responsible Supply Chains in the Garment and Footwear Sector. Available at: [https://read.oecd-ilibrary.org/governance/oecd-due-diligence-guidance-for-responsible-supply-chains-in-the-garment-and-footwear-sector\\_9789264290587-en](https://read.oecd-ilibrary.org/governance/oecd-due-diligence-guidance-for-responsible-supply-chains-in-the-garment-and-footwear-sector_9789264290587-en)
- Oxfam International (2004). Trading Away Our Rights. Available at: <https://www.ituc-csi.org/IMG/pdf/cr-trading-away-rights-women-global-supply-chains-10404-en.pdf>.
- PACE (2021). Circular Economy Action Agenda, Textiles. Available at <https://pacecircular.org/sites/default/files/2021-02/circular-economy-action-agenda-textiles.pdf>
- (n.d.). Circular Economy Action Agenda. Available at: <https://pacecircular.org/action-agenda>
- Pesticide Action Network and International Cotton Advisory Committee (n.d.). Pesticide concerns in cotton. Available at: <https://www.pan-uk.org/cotton/>
- Pesticide Action Network and the Environmental Justice Foundation (2007). The Deadly Chemicals in Cotton. Available at: [https://ejfoundation.org/resources/downloads/the\\_deadly\\_chemicals\\_in\\_cotton.pdf](https://ejfoundation.org/resources/downloads/the_deadly_chemicals_in_cotton.pdf)
- Quantis (2018). Measuring Fashion: Environmental Impact of the Global Apparel and Footwear Industries. Available at: [https://quantis.com/wp-content/uploads/2018/03/measuringfashion\\_globalimpactstudy\\_full-report\\_quantis\\_cwf\\_2018a.pdf](https://quantis.com/wp-content/uploads/2018/03/measuringfashion_globalimpactstudy_full-report_quantis_cwf_2018a.pdf)
- Roos et al (2019). Environmental assessment of Swedish clothing consumption. Available at: <http://mistrafuturefashion.com/impact-of-swedish-clothing-consumption/>



- Science Based Targets Network (2020). Initial Company Guidance. Available at: <https://sciencebasedtargetsnetwork.org/wp-content/uploads/2020/09/SBTN-initial-guidance-for-business.pdf>
- (n.d.). Freshwater. Available at : <https://sciencebasedtargetsnetwork.org/issue-hubs/water/>
- (n.d.). Biodiversity. Available at: <https://sciencebasedtargetsnetwork.org/issue-hubs/biodiversity/>
- (n.d.). Resources. Available at: <https://sciencebasedtargetsnetwork.org/resources/>
- Secretariat of the Convention on Biological Diversity (2020). Assessing Progress towards Aichi Biodiversity Target 6 on Sustainable Marine Fisheries. Available at: <https://www.cbd.int/doc/publications/cbd-ts-87-en.pdf>
- Sivasankaran,A., (2014). Work and Women's Marriage, Fertility and Empowerment: Evidence from Textile Mill Employment in India. Available at: [https://scholar.harvard.edu/files/asivasankaran/files/jobmarketpaper\\_anithasivasankaran.pdf](https://scholar.harvard.edu/files/asivasankaran/files/jobmarketpaper_anithasivasankaran.pdf)
- SME Finance Forum (2020). Annual Report. Available at: [https://www.smeffinanceforum.org/sites/default/files/SMEFF-ANNUAL-REPORT-2020-for-web\\_0.pdf](https://www.smeffinanceforum.org/sites/default/files/SMEFF-ANNUAL-REPORT-2020-for-web_0.pdf)
- Statista (2022). Revenue of the apparel market worldwide from 2014 to 2027. Available at: <https://www.statista.com/forecasts/821415/value-of-the-global-apparel-market>
- Strategic Approach to International Chemicals Management (n.d.). Chemical in Textiles. Available at: <https://saicmknowledge.org/topic/chemicals-textiles>
- Sourcing Journal (2021). Sustainable Apparel Coalition Embarks on 'Bold' Second Decade of Action. Available at: <https://sourcingjournal.com/topics/sustainability/sustainable-apparel-coalition-10-years-higg-index-climate-change-transparency-262706/>
- Textile Exchange (2021). Corporate Fiber & Materials Benchmark. Available at: <https://textileexchange.org/faq/what-is-the-corporate-fiber-and-materials-benchmark/>
- (n.d.). About Us: Climate. Available at: <https://textileexchange.org/about-us/climate/>
- Textile Exchange (n.d.a). The 2025 Recycled Polyester Challenge. Available at: <https://textileexchange.org/2025-recycled-polyester-challenge/>
- (n.d.b). 2025 Sustainable Cotton Challenge. Available at: <https://textileexchange.org/2025-sustainable-cotton-challenge/>
- (n.d.c). Biodiversity. Available at: <https://textileexchange.org/biodiversity/>
- thredUP (2021). Fashion Resale Market Report 2021. Available at: <https://www.thredup.com/resale/2021>
- Transparency Pledge (n.d.). Our Demands. Available at: <https://transparencypledge.org/our-demands/>
- United Nations (n.d.). Sustainable Development Agenda. Available at: <https://www.un.org/sustainabledevelopment/development-agenda/>
- UNECE (2022). Enhancing traceability and transparency of sustainable value chains in the garment and footwear industry, Recommendation N°46. Available at: <https://unece.org/sites/default/files/2022-01/ECE-TRADE-463E.pdf>
- UNECE and UN/CEFACT (2021). Traceability for Sustainable Garment and Footwear. Available at: [https://unece.org/sites/default/files/2021-03/ECE\\_TRADE\\_C\\_CEFACT\\_2020\\_06\\_Rev1E\\_0.pdf](https://unece.org/sites/default/files/2021-03/ECE_TRADE_C_CEFACT_2020_06_Rev1E_0.pdf)
- UNEP (2020). Triple Planetary Crisis: Forging a New Relationship between People and Earth. Available at: <https://www.unep.org/news-and-stories/speech/triple-planetary-crisis-forging-new-relationship-between-people-and-earth>
- UNEP (2023a). Shifting the Fashion Narrative. Available at: <https://www.unep.org/sustainable-fashion>
- (2022). Enhancing circular economy as a contribution to achieving sustainable consumption and production. Available at: <https://wedocs.unep.org/handle/20.500.11822/39747>
- (2021). Catalysing Science-based Policy Action On Sustainable Consumption And Production. Available at: <https://www.unep.org/resources/publication/catalysing-science-based-policy-action-sustainable-consumption-and-production>
- (2021a). For people and planet: the United Nations Environment Programme strategy for 2022–2025 to tackle climate change, loss of nature and pollution. Available at: <https://wedocs.unep.org/bitstream/handle/20.500.11822/35162/Doc3%20Reve1%20EnglishK2100501.pdf?sequence=1&isAllowed=y>

- (2021b). International Good Practice Principles for Sustainable Infrastructure. Available at: <https://www.unep.org/resources/publication/international-good-practice-principles-sustainable-infrastructure>
  - (2021c). Sustainable Fashion Communication Strategy 2021-2024. Available at: <https://www.unep.org/resources/publication/sustainable-fashion-communication-strategy-2021-2024>
  - (2020). Sustainability and Circularity in the Textile Value Chain: Global Stocktaking. Available at: <https://wedocs.unep.org/handle/20.500.11822/34184>
  - (2020a). Emissions Gap Report. Available at: <https://www.unep.org/interactive/emissions-gap-report/2020/>
  - (2019). Global Environment Outlook – GEO-6: Healthy Planet, Healthy People. Available at: [https://www.unep.org/resources/global-environment-outlook-6?\\_ga=2.131346575.1679879826.1665402940-81201363.1652359177](https://www.unep.org/resources/global-environment-outlook-6?_ga=2.131346575.1679879826.1665402940-81201363.1652359177)
  - (2019a). UNEP Circularity Platform. Available at: <https://www.unep.org/circularity>
  - (2019b). Innovative pathways to achieve sustainable consumption and production. Available at: <https://leap.unep.org/content/unea-resolution/innovative-pathways-achieve-sustainable-consumption-and-production>
  - (2018). Mapping of Global Plastics Value Chain and Plastics Losses to the Environment: with a Particular Focus on Marine Environment. Available at: <https://wedocs.unep.org/handle/20.500.11822/26745>
  - (2016). A framework for shaping sustainable lifestyles. Available at: [https://www.oneplanetnetwork.org/sites/default/files/a\\_framework\\_for\\_shaping\\_sustainable\\_lifestyles\\_determinants\\_and\\_strategies\\_0.pdf](https://www.oneplanetnetwork.org/sites/default/files/a_framework_for_shaping_sustainable_lifestyles_determinants_and_strategies_0.pdf)
- United Nations Fashion Alliance (n.d.). UN Alliance for Sustainable Fashion. Available at: <https://unfashionalliance.org/>
- United Nations Framework Convention on Climate Change (2021). Fashion Industry Charter for Climate Action. Available at: [https://unfccc.int/sites/default/files/resource/Fashion%20Industry%20Carter%20for%20Climate%20Action\\_2021.pdf](https://unfccc.int/sites/default/files/resource/Fashion%20Industry%20Carter%20for%20Climate%20Action_2021.pdf)
- Verite (2019). At Risk in the Recycling Sector Supply Chain. Available at: <https://verite.org/at-risk-in-recycling-sector/>
- Vogue Business (2021). Brutal Honesty: The new look sustainable marketing. Available at: <https://www.voguebusiness.com/sustainability/brutal-honesty-the-new-look-sustainable-marketing-ace-and-tate>
- World Resources Institute and the Apparel Impact Institute (2021). Roadmap to Net-Zero: Delivering Science-Based Targets in the Apparel Sector. Available at: <https://files.wri.org/d8/s3fs-public/2021-11/roadmap-net-zero-delivering-science-based-targets-apparel-sector.pdf?VersionId=LxrwUSv9dHytM7zybuQgoJ8LUHBZVgM1>
- WWF (2017). Cutting Cotton Carbon Emissions. Available at: <https://www.wfindia.org/?9120/Cutting-cotton-carbon-emissions-Findings-from-Warangal-India>
- (2021). Open Letter on Sustainable post-Covid recovery in textile sector. Available at: [https://wwf.panda.org/wwf\\_news/?539631/Open-Letter-on-Sustainable-post-Covid-recovery-in-textile-sector](https://wwf.panda.org/wwf_news/?539631/Open-Letter-on-Sustainable-post-Covid-recovery-in-textile-sector)
  - (n.d.). Science Targets for Water. Available at: [https://wwf.panda.org/discover/our\\_focus/freshwater\\_practice/water\\_management/science\\_targets\\_water](https://wwf.panda.org/discover/our_focus/freshwater_practice/water_management/science_targets_water)
  - (n.d.). Water Stewardship. Available at: [https://wwf.panda.org/discover/our\\_focus/freshwater\\_practice/water\\_management/](https://wwf.panda.org/discover/our_focus/freshwater_practice/water_management/)
- ZDHC (n.d.). Roadmap to Zero. Available at: <https://www.roadmaptozero.com/>



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